

M67001.AR.005845  
MCB CAMP LEJEUNE  
5090.3a

FINAL SITE-SPECIFIC WORK PLAN ADDENDUM FOR MUNITIONS RESPONSE ACTIVITIES  
MCB CAMP LEJEUNE NC  
12/1/2013  
CH2M HILL

**Final**

**Site-Specific Work Plan Addendum for  
Munitions Response Activities  
Marine Corps Air Station New River Runway Expansion Area**

**Marine Corps Installations East - Marine Corps Base Camp Lejeune  
North Carolina**

**Contract Task Order WE5A**

**December 2013**

Prepared for

**Department of the Navy  
Naval Facilities Engineering Command  
Mid-Atlantic**

Under the

**NAVFAC CLEAN Program  
Contract N62470-08-D-8012**

Prepared by



**CH2MHILL**

**3900 N. Causeway Blvd., Suite 1250  
New Orleans, Louisiana 70002**

# Contents

---

<b>Acronyms and Abbreviations.....</b>	<b>vii</b>
<b>1 Introduction .....</b>	<b>1-1</b>
1.1 Objective .....	1-1
1.2 Work Plan Addendum Scope and Organization.....	1-1
1.3 Site Location and Description .....	1-2
1.4 Site History.....	1-3
1.5 Climate .....	1-3
1.6 Geology and Hydrogeology.....	1-3
<b>2 Technical Management Plan.....</b>	<b>2-1</b>
2.1 Munitions Response Guidance, Regulations, and Policy .....	2-1
2.2 Munitions and Explosives of Concern Contingency Procedures.....	2-1
2.3 Chemical Warfare Materiel Contingency Procedures .....	2-1
2.4 Project Personnel, Organization, and Schedule.....	2-1
2.4.1 Project Organization .....	2-1
2.4.2 Project Personnel.....	2-1
2.4.3 Project Schedule .....	2-1
2.5 Technical Approach.....	2-2
2.5.1 Project Management .....	2-2
2.5.2 Work Planning.....	2-2
2.5.3 Intrusive Investigation .....	2-3
2.5.4 Reporting .....	2-3
<b>3 Field Investigation Plan .....</b>	<b>3-1</b>
3.1 Overall Approach .....	3-1
3.2 Site Preparation and Restoration .....	3-1
3.2.1 Planning .....	3-1
3.2.2 Mobilization .....	3-1
3.2.3 Buried Utility Clearance .....	3-2
3.2.4 Site Survey .....	3-2
3.2.5 Site Restoration and Demobilization .....	3-2
3.3 Anomaly Avoidance .....	3-3
3.4 Geophysical Investigation Plan .....	3-3
3.4.1 Geophysical Investigation Approach .....	3-3
3.4.2 Geophysical Systems Verification.....	3-3
3.5 Geospatial Information and Electronic Submittals.....	3-3
3.6 Munitions and Explosives of Concern Investigation.....	3-3
3.6.1 Investigation Approach.....	3-3
3.6.2 Digital Geophysical Mapping Anomaly Reacquisition .....	3-4
3.6.3 Intrusive Investigation .....	3-4
3.6.4 Mag-and-Dig .....	3-5
3.6.5 Removal Verification.....	3-5
3.7 Procedures for Reporting and Disposition of Munitions and Explosives of Concern and Material Potentially Presenting an Explosive Hazard Items .....	3-6
3.7.1 Overall Safety Precautions.....	3-6
3.7.2 Data Reporting.....	3-6
3.7.3 Operations in Populated and Sensitive Areas.....	3-6
3.7.4 Exclusion Zones and Separation Distances .....	3-6

3.7.5	Munitions and Explosives of Concern and Material Potentially Presenting an Explosive Hazard Hazards Classification, Storage, and Transportation .....	3-7
3.7.6	Munitions and Explosives of Concern Disposition .....	3-7
3.7.7	Material Potentially Presenting an Explosive Hazard Disposition.....	3-7
3.7.8	Recording, Reporting, and Implementation of Lessons Learned during the Project	3-7
3.8	Quality Control Seed Recovery Verification .....	3-7
3.9	Grid Completion Verification.....	3-8
3.10	Field Sampling Plan.....	3-8
3.10.1	Field Operations .....	3-8
3.10.2	Investigation-Derived Waste Management .....	3-9
3.11	Health and Safety Plan .....	3-9
3.12	Data Management.....	3-9
3.13	Project File Requirements .....	3-10
3.14	Construction Support .....	3-10
<b>4</b>	<b>Explosives Management Plan .....</b>	<b>4-1</b>
<b>5</b>	<b>Explosives Siting Plan .....</b>	<b>5-1</b>
<b>6</b>	<b>Quality Control Plan.....</b>	<b>6-1</b>
<b>7</b>	<b>Environmental Protection Plan.....</b>	<b>7-1</b>
7.1	Regional Ecological Summary.....	7-1
7.2	Endangered and Threatened Species within the Project Site .....	7-1
7.3	Migratory Birds within the Project Site .....	7-1
7.4	Wetlands within the Project Site.....	7-1
7.5	Cultural and Archaeological Resources within the Project Site .....	7-2
7.6	Water Resources within the Project Site.....	7-2
7.7	Vegetation to be Removed within the Project Site.....	7-2
7.8	Existing Waste Disposal Sites within the Project Site.....	7-2
7.9	Compliance with Applicable or Relevant and Appropriate Requirements .....	7-2
7.10	Spill Prevention and Control.....	7-2
7.11	Detailed Procedures and Methods to Protect and/or Mitigate the Resources and Sites Identified .....	7-2
<b>8</b>	<b>References.....</b>	<b>8-1</b>

## Appendixes

A	Geophysical Investigation Plan
B	Geophysical System Verification Plan
C	Health and Safety Plan
D	Standard Operating Procedures
E	Quality Control Forms

**Tables**

- 2-1 Project Personnel Contact Information
- 6-1 Definable Features of Work Auditing Procedures
- 7-1 Species Potentially Occurring on or Adjacent to MCIEAST-MCB CAMLEJ, in Onslow County, Listed as Threatened, Endangered, or of Special Concern by USFWS

**Figures**

- 1-1 Base Location Map
- 1-2 Site Location Map
- 2-1 Project Schedule
- 3-1 Digital Geophysical Mapping Investigative Area
- 3-2 ESQD Arcs for the Primary MGFD
- 3-3 ESQD Arcs for the Contingency MGFD
- 7-1 Wetlands Locations

# Acronyms and Abbreviations

---

amsl	above mean sea level
ASR	Archives Search Report
bgs	below ground surface
BIP	blow-in-place
CLEAN	Comprehensive Long-term Environmental Action—Navy
CWM	chemical warfare materiel
DGM	Digital Geophysical Mapping
DoD	Department of Defense
EM	Environmental Manager
EPP	Environmental Protection Plan
ESQD	explosives safety-quantity distance
ESS	Explosives Safety Submission
EZ	exclusion zone
GIP	Geophysical Investigation Plan
GSV	Geophysical System Verification
H&S	Health and Safety
HSP	Health and Safety Plan
MARCORSYSCOM	Marine Corps Systems Command
MBTA	Migratory Bird Treaty Act
MCAS	Marine Corps Air Station
MCIEAST-MCB CAMLEJ	Marine Corps Installations East-Marine Corps Base Camp Lejeune
MDAS	material documented as safe
MEC	munitions and explosives of concern
MGFD	munition with the greatest fragmentation distance
MILCON	military construction
mm	millimeter
MPPEH	material potentially presenting an explosive hazard
MRP	Munitions Response Program
MRA	Munitions Response Area
MRS	Munitions Response Site
NAVFAC	Naval Facilities Engineering Command
NAVSEA	Naval Sea Systems Command
NOSSA	Naval Ordnance Safety and Security Activity
PM	Project Manager
PVC	polyvinyl chloride
QC	quality control
QCP	Quality Control Plan
RCW	red-cockaded woodpecker
RPM	Remedial Project Manager
SOP	standard operating procedure
SUXOS	Senior Unexploded Ordnance Supervisor
USEPA	United States Environmental Protection Agency

USFWS	United States Fish and Wildlife Service
UXO	unexploded ordnance
UXOSO	Unexploded Ordnance Safety Officer
UXOQCS	Unexploded Ordnance Quality Control Specialist
VSP	Visual Sampling Plan

## SECTION 1

# Introduction

---

Marine Corps Installations East-Marine Corps Base Camp Lejeune (MCIEAST-MCB CAMLEJ) is conducting a munitions and explosives of concern (MEC) investigation at Marine Corps Air Station (MCAS) New River - Runway Expansion Area, which is referred to herein as the Munitions Response Area (MRA), in support of future military construction (MILCON) activities (**Figures 1-1** and **1-2**). The MCAS New River - Runway Expansion Area boundary overlaps a portion of Site Unexploded Ordnance (UXO)-29 at MCAS New River.

This MEC investigation is being conducted by CH2M HILL under the Naval Facilities Engineering Command (NAVFAC) Mid-Atlantic Comprehensive Long-term Environmental Action—Navy (CLEAN) Contract N62470-11-D-8012, Contract Task Order WE5A.

## 1.1 Objective

The objective of this MEC investigation is to reduce the potential for encountering MEC and material potentially presenting an explosive hazard (MPPEH) during MILCON activities.

## 1.2 Work Plan Addendum Scope and Organization

This Work Plan Addendum is designed to describe site-specific activities not addressed in the Munitions Response Program (MRP) Master Project Plans (CH2M HILL, 2008). An Explosives Safety Submission (ESS) was approved by Marine Corps Systems Command (MARCORSYSCOM) and endorsed by the Department of Defense (DoD) Explosives Safety Board on September 19, 2013. An amendment to the ESS will be submitted to MARCORSYSCOM to include the processing of an additional pile of soil. Approval of the ESS must be obtained before any intrusive activity begins on the site.

The *ESS Determination Request for Running Path and Airfield Clear Zones Non-Intrusive Maintenance, MCAS, New River* (MCIEAST-MCB CAMLEJ, 2013) was submitted to MARCORSYSCOM on July 9, 2013. The ESS Determination Request allows for non-intrusive operations (that is, mowing and non-intrusive maintenance to running paths) to be conducted while anomaly avoidance is performed.

The following activities will be performed in accordance with the MRP Master Project Plans and this Work Plan Addendum to accomplish the objectives described as follows:

- Prepare site preparation, including site survey, to facilitate Digital Geophysical Mapping (DGM).
- Perform DGM over 100 percent of the 6.8 acres of MRS 1 where future roadways, buried utility lines, and fence will be placed to identify geophysical anomalies representing potential subsurface MEC.
- Conduct a MEC intrusive investigation by reacquiring and excavating all geophysical anomalies that are identified as representing potential subsurface MEC to determine the sources of the anomalies.
- Process 200 cubic yards of soil currently stockpiled onsite using analog geophysical surveys and anomaly investigation (mag-and-dig) methods at MRS 1A and 2.
- Perform demolition and demilitarization, as needed, of MEC and MPPEH identified during the intrusive activity.
- Conduct post-detonation sampling of all MEC or MPPEH items destroyed by controlled detonation methods.
- Prepare a Technical Memorandum documenting the MEC intrusive investigation.



- Optional: Perform additional mag-and-dig in lifts at areas where proposed MILCON activities will extend to depths beyond the detection capabilities of the DGM equipment (such as areas planned for buried utilities and fence posts) when MEC and MPPEH is suspected to be present.
- Optional: Provide onsite/on-call construction support for MILCON earthwork activities when MEC and MPPEH are not suspected to be present.

This Work Plan Addendum is divided into the following sections providing information on the approach and procedures to be employed during the execution of the project. Appendixes to the Work Plan Addendum provide supporting documentation that detail specific procedures for the execution of the project.

- **Section 1, Introduction**, provides general information about this Work Plan Addendum, describes the MRA, summarizes the history of the site, and presents the project scope and objectives.
- **Section 2, Technical Management Plan**, identifies the technical approach, methods, and operational procedures that will be used to execute the MEC investigation project.
- **Section 3, Field Investigation Plan**, identifies the technical approach, methods, and operational procedures that will be used to execute the field investigation activities, including mobilization and demobilization, land surveying, DGM, MEC intrusive investigation (including disposal of non-MEC and non-MPPEH anomaly source material), and demilitarization of MEC and MPPEH (if required).
- **Section 4, Explosives Management Plan**, provides details for management of explosives in accordance with applicable regulations.
- **Section 5, Explosives Siting Plan**, provides explosives safety criteria for planning and siting explosives operations.
- **Section 6, Quality Control Plan (QCP)**, provides details of the approach, methods, and operational procedures to be employed for quality control (QC) for the munitions response.
- **Section 7, Environmental Protection Plan (EPP)**, describes the approach, methods, and operational procedures to be employed to protect the natural environment during the performance of all tasks for the munitions response.
- **Section 8, References**, lists the references cited in the preceding sections.
- **Appendix A, Geophysical Investigation Plan (GIP)**, details the approach, methods, and operational procedures that will be used in performing geophysical investigation.
- **Appendix B, Geophysical System Verification (GSV) Plan**, details the activities to be performed for validating DGM systems to be utilized at the site.
- **Appendix C, Health and Safety Plan (HSP)**, provides an interface with CH2M HILL's overall Health and Safety (H&S) program. The HSP also includes the MEC avoidance procedures that will be used to ensure that onsite personnel are protected from MEC that may be present at the site.
- **Appendix D, Standard Operating Procedures (SOPs)**, details the approach, methods, and operational procedures that will be used in performing removal of geophysical anomalies and MEC, if discovered, during the MEC intrusive investigation.
- **Appendix E, Quality Control Forms**, contains blank QC forms that will be used to document the execution of the multiple layers of QC conducted during the field effort as specified in the QCP.

## 1.3 Site Location and Description

The MRA encompasses approximately 10.4 acres south of MCAS New River. The site is located on the west bank of Morgan Bay, which is connected to the New River (**Figure 1-1**).

Based on a review of publicly available aerial photographs and site reconnaissance, the topography of the MRA is relatively flat and characterized by low elevations and relatively low relief. Surface elevations range from approximately 20 feet above mean sea level (amsl) to approximately 40 feet amsl. Site vegetation consists of a grass field maintained by Base personnel. The MRA is used for support facilities around MCAS New River, including runway maintenance shops, marinas, and recreational parks.

The 10.4 acre MRA is broken up into two different munitions response sites (MRS). MRS 1 is 9.2 acres and includes approximately 2,600 feet of future roadway, buried utilities, fence line, and approximately 75 cubic yards of stockpiled soil (stockpiled soil and processing area within MRS 1 is referred to MRS 1A from this point forward). MRS 2 (0.7 acres) contains approximately 125 cubic yards of stockpiled soil. The soil stockpiled at MRS 1A and 2 originates from the MILCON earth disturbing activities. There is a 0.5 acre bridge of land between MRS 1 and 2 within the MRA that will not receive a munitions response.

Approximately 2 acres of the MRA lie within MRP Site UXO-29. According to the *Final Range Identification and Preliminary Range Assessment* (USACE, 2001a) and the Archives Search Report (ASR) (USACE, 2001b), Site UXO-29 is approximately 182 acres in area and is composed of the historical terrestrial range fan sections of ASR #2.29, former Infantry Weapons Demonstration Course, B17; ASR #2.1, former Artillery Training Area (1941); and ASR #2.167, former Hand Grenade Range (Practice) Demonstrator, M113. The MRA crosses the ASR #2.29, former Infantry Weapons Demonstration Course, B-17, portion of Site UXO-29. The extents of Site UXO-29 and the MRA boundaries are displayed on **Figure 1-2**.

## 1.4 Site History

The MRA is part of MCAS New River approach and take-off safety zone for the runways. In the event of an emergency an aircraft may use the MRA for landing.

The former Infantry Weapons Demonstration Course, B-17, firing point is described as being located just south of MCAS New River runways. The range fan extends south across Morgan Bay and Roger Point Road. Historical information indicates that the range was active from 1946 to 1947. The general types of ordnance used were: small arms up to .50 caliber; 60-millimeter (mm) and 81-mm cartridges; 2.36-inch and 4.5-inch rockets; 37-mm guns; and 57-mm, 75-mm, and 90-mm projectiles.

While the initial MILCON activities were being performed by MILCON contractors, three 2.36-inch, Practice Bazooka rounds were discovered, which halted construction. The incident report provided by MCIEAST-MCB CAMLEJ did not provide nomenclature, it only noted that “No Hazard” was determined from the Explosive Ordnance Disposal. The MCIEAST-MCB CAMLEJ Explosive Ordnance Disposal unit responded to each rocket discovery. It is assumed that the MEC and MPPEH found during the MILCON activities originated from the ASR #2.29, former Infantry Weapons Demonstration Course, B-17.

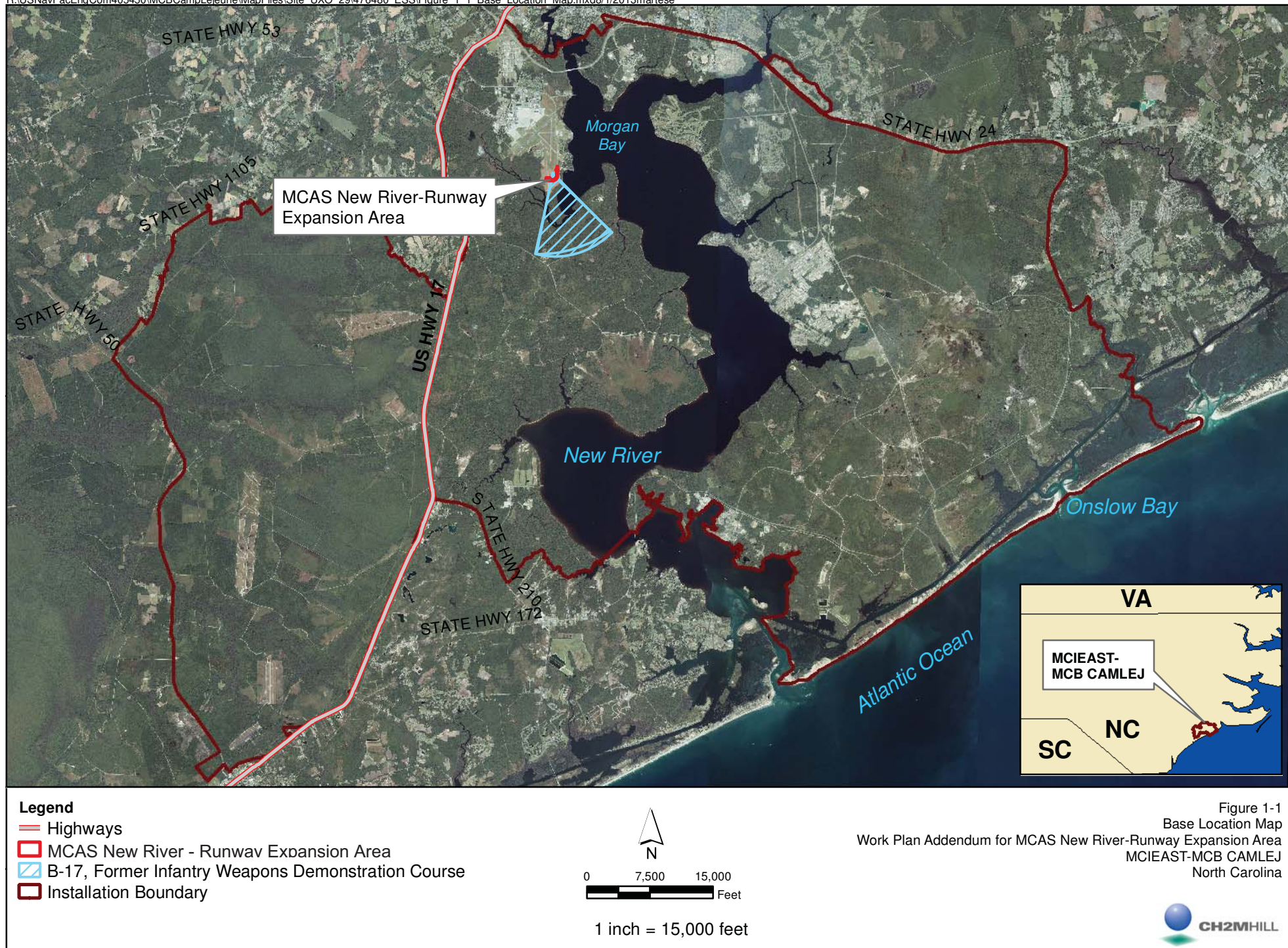
## 1.5 Climate

The climate in the MCIEAST-MCB CAMLEJ area is discussed in Section 1.4 of the MRP Master Project Plans (CH2M HILL, 2008).

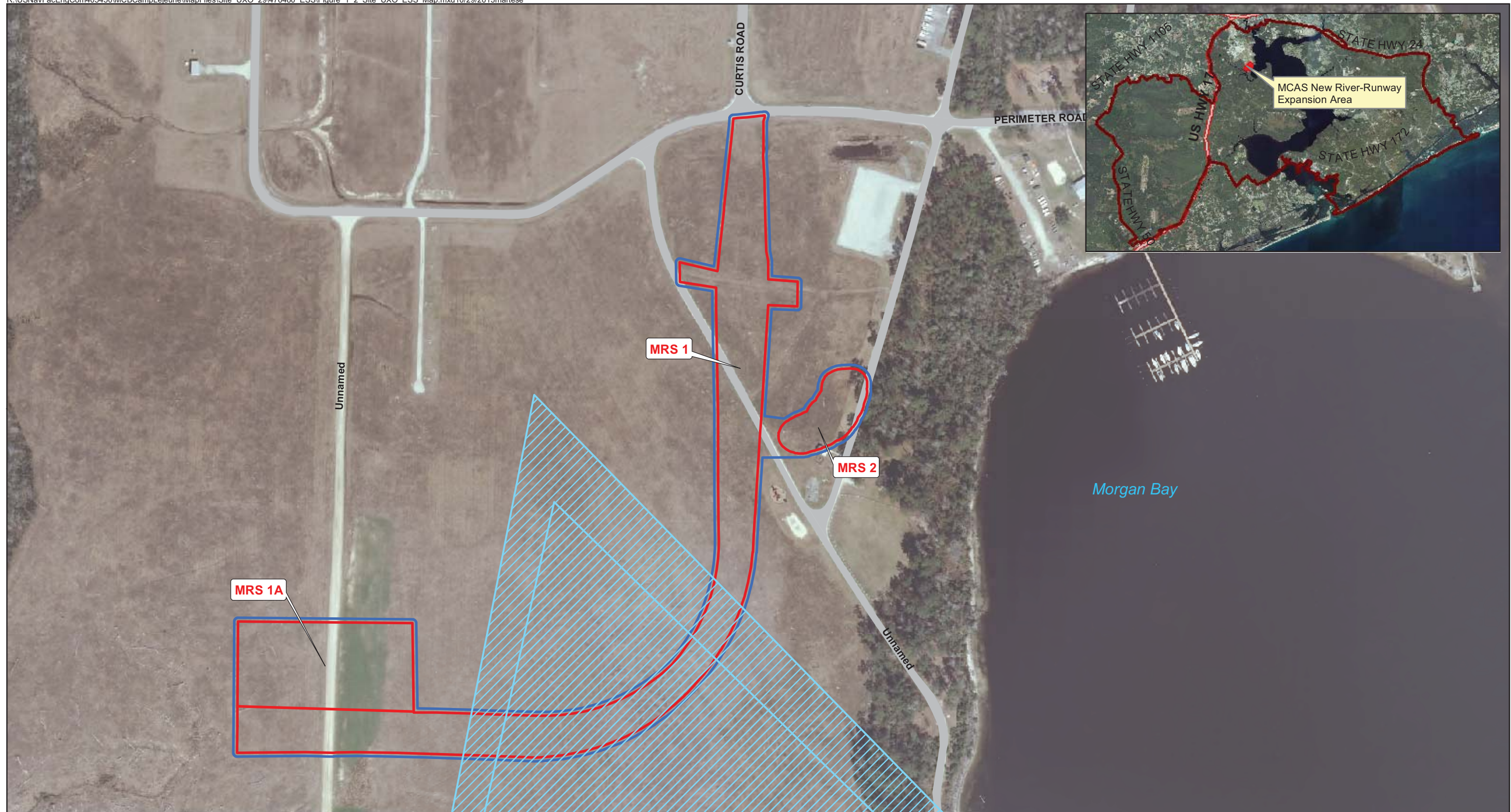
## 1.6 Geology and Hydrogeology

Regional geology and hydrogeology at MCIEAST-MCB CAMLEJ are discussed in Sections 1.6 and 1.7 of the MRP Master Project Plans (CH2M HILL, 2008). The depth of the MEC investigation is expected to extend to the maximum depth of the planned MILCON ground-disturbing activities, which is 5 feet below ground surface (bgs). The depth to water at the site is expected to be greater than 5 feet bgs.









- Legend**
- MRS Boundary
  - MRA Boundary
  - B-17, Former Infantry Weapons Demonstration Course
  - Installation Boundary

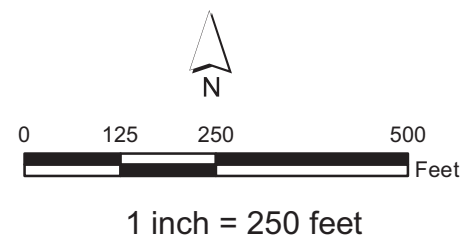


Figure 1-2  
Site Map  
Work Plan Addendum for MCAS New River-Runway Expansion Area  
MCIEAST-MCB CAMLEJ  
North Carolina

## SECTION 2

# Technical Management Plan

---

The Technical Management Plan identifies the technical approach, methods, and operational procedures that will be used to execute the project.

## 2.1 Munitions Response Guidance, Regulations, and Policy

The MEC investigation at the MRSs will be conducted in accordance with the guidance documents, regulations, and policies described in Section 2.1 of the MRP Master Project Plans (CH2M HILL, 2008).

## 2.2 Munitions and Explosives of Concern Contingency Procedures

Based upon the documented history of DoD activities at the MRA, it is anticipated that if MEC is discovered it can be destroyed onsite. Therefore, alternatives to onsite disposal are not identified in this Work Plan Addendum. If MEC items are discovered that cannot be identified, MEC contingency procedures will be conducted in accordance with Section 2.2 of the MRP Master Project Plans (CH2M HILL, 2008).

## 2.3 Chemical Warfare Materiel Contingency Procedures

Based on the documented history of DoD activities at the MRA, it is not anticipated that chemical warfare materiel (CWM) will be discovered. However, in the event that CWM is encountered, all work will immediately cease and CWM contingency procedures will be conducted in accordance with Section 2.3 of the MRP Master Project Plans (CH2M HILL, 2008).

## 2.4 Project Personnel, Organization, and Schedule

This section describes the project organization and key personnel involved with executing the work described in the Work Plan Addendum.

### 2.4.1 Project Organization

The key organizations involved in this project are NAVFAC, MCIEAST-MCB CAMLEJ, and CH2M HILL. Project execution will be conducted by CH2M HILL and its subcontractors; specific duties for CH2M HILL and its subcontractors are described in Section 2.4 of the MRP Master Project Plans (CH2M HILL, 2008). CH2M HILL will issue subcontracts for MEC support, buried utility locating, land surveying, DGM surveying, and laboratory analysis.

### 2.4.2 Project Personnel

The reporting relationship between key project personnel and the roles and responsibilities of the key personnel are discussed in Section 2.4 of the MRP Master Project Plans (CH2M HILL, 2008). Contact information for key project personnel is shown in **Table 2-1**.

### 2.4.3 Project Schedule

**Figure 2-1** presents a detailed project schedule, including key milestones.



TABLE 2-1

**Project Personnel Contact Information**

<b>Name/Title/Organization</b>	<b>Mailing Address</b>	<b>Telephone/E-mail</b>
Bryan Beck Remedial Project Manager (RPM)	NAVFAC Mid-Atlantic 6506 Hampton Blvd. Norfolk, VA 23508-1278	757-322-4734 <a href="mailto:bryan.k.beck@navy.mil">bryan.k.beck@navy.mil</a>
Charity Rychak Base Environmental Management Department Environmental Engineer	MCIEAST-MCB CAMLEJ 12 Post Lane Camp Lejeune, NC 28547	910-451-9385 <a href="mailto:charity.rychak@usmc.mil">charity.rychak@usmc.mil</a>
Doug Dronfield Program Manager	CH2M HILL 15010 Conference Center Drive Suite 200 Chantilly, VA 20151	703-376-5090 (office) <a href="mailto:Doug.Dronfield@ch2m.com">Doug.Dronfield@ch2m.com</a>
Noah Weinberg Project Manager (PM)	CH2M HILL 4600 South Miro Street New Orleans, LA 70125	623-521-4503 (mobile) <a href="mailto:Noah.Weinberg@ch2m.com">Noah.Weinberg@ch2m.com</a>
Matt Louth Activity Manager	CH2M HILL 5700 Cleveland Street Suite 101 Virginia Beach, VA 23462	757-671-6240 (office) <a href="mailto:Matt.Louth@ch2m.com">Matt.Louth@ch2m.com</a>
Thomas M. Roth, P.E. Senior Technical Consultant	CH2M HILL 2607 Lavista Road Decatur, GA 30033-1725	404-474-7640 (office) 404-259-6674 (mobile) <a href="mailto:Tom.Roth@ch2m.com">Tom.Roth@ch2m.com</a>
Carl Woods, C.I.H. Environmental H&S Manager	CH2M HILL 10123 Alliance Road Suite 300 Cincinnati, OH 45242	513-889-5771 x49353 (office) 513-319-5771 (mobile) <a href="mailto:Carl.Woods@ch2m.com">Carl.Woods@ch2m.com</a>
Tim Garretson MR Integrator/Senior MEC Technical Consultant	CH2M HILL 9428 Baymeadows Road Suite 300 Jacksonville, FL 32256	757-287-52221 (mobile) <a href="mailto:Timothy.Garretson@ch2m.com">Timothy.Garretson@ch2m.com</a>
George DeMetropolis, PhD MR H&S Manager/QC Officer	CH2M HILL 402 W. Broadway Ste. 1450 San Diego, CA 92101	619-564-9627 (mobile) <a href="mailto:George.DeMetropolis@ch2m.com">George.DeMetropolis@ch2m.com</a>
Matt Barner Project Geophysicist	CH2M HILL 11301 Carmel Commons Blvd Suite 304 Charlotte, NC 28226	704-544-4040 (office) <a href="mailto:Matt.Barner@ch2m.com">Matt.Barner@ch2m.com</a>

## 2.5 Technical Approach

### 2.5.1 Project Management

Project management includes all work necessary for controlling the project budget and schedule. This includes monthly status reports and invoicing, as well as all other administrative tasks needed for project performance.

### 2.5.2 Work Planning

This task includes Work Plan Addendum preparation, including preparation of the GIP (**Appendix A**), GSV Plan (**Appendix B**), and HSP (**Appendix C**).

A draft Work Plan Addendum will be submitted electronically for NAVFAC and MCIEAST-MCB CAMLEJ review. A revised Work Plan Addendum will be submitted to the Partnering Team for review upon incorporation of comments from NAVFAC and MCIEAST-MCB CAMLEJ. A final Work Plan Addendum will be prepared that will address all comments on the draft document.

Subcontractor procurement is also included under this task. Anticipated subcontractor services include MEC support, buried utility locating, land surveying, DGM surveying, and laboratory analysis.

### **2.5.3 Intrusive Investigation**

The scope of the field investigation and the technical approach are presented in Section 3. The highlighted field investigation activities include:

- MEC avoidance
- Site preparation (utility locating and site survey)
- DGM survey and anomaly reacquisition
- Intrusive investigation
- Mag-and-dig
- MEC, MPPEH, and scrap management and disposition
- Construction support

### **2.5.4 Reporting**

A Technical Memorandum will be prepared to document the results of the MEC intrusive investigation. A draft and then final Technical Memorandum will be provided to NAVFAC and MCIEAST-MCB CAMLEJ after their review.

ID	Task Name	Duration	Start	Finish	Predecessors	Qtr 3, 2013												Qtr 4, 2013												Qtr 1, 2014																			
1	Chartering Meeting	1 day	Wed 6/26/13	Wed 6/26/13		6/2	6/9	6/16	6/23	6/30	7/7	7/14	7/21	7/28	8/4	8/11	8/18	8/25	9/1	9/8	9/15	9/22	9/29	10/6	0/1	0/2	0/2	11/3	1/1	1/1	1/2	12/1	12/8	2/1	2/2	2/2	1/5	1/12	1/19	1/26	2/2	2/9	2/16	2/23	3/2	3/9	3/16	3/23	3/30
2	Work Plan	90 days	Mon 7/22/13	Fri 11/22/13																																													
3	Draft	26 days	Mon 7/22/13	Mon 8/26/13																																													
4	Client Review	15 days	Mon 8/12/13	Fri 8/30/13																																													
5	Draft Final	10 days	Mon 9/2/13	Fri 9/13/13	4																																												
6	Regulator Review	20 days	Mon 10/28/13	Fri 11/22/13																																													
7	ESS	76 days	Tue 6/18/13	Tue 10/1/13																																													
8	Draft	19 days	Tue 6/18/13	Fri 7/12/13																																													
9	Client Review	10 days	Mon 8/12/13	Fri 8/23/13																																													
10	MARCORSYSCOM Review	18 days	Thu 7/18/13	Mon 8/12/13																																													
11	Final	7 days	Tue 8/13/13	Wed 8/21/13																																													
12	MARCORSYSCOM Service Approval	30 days	Wed 8/21/13	Tue 10/1/13																																													
13	ESS Amnd 1	18 days	Thu 10/24/13	Mon 11/18/13																																													
14	Draft Amendment	6 days	Thu 10/24/13	Thu 10/31/13																																													
15	Client Reivew	5 days	Fri 11/1/13	Thu 11/7/13	14																																												
16	MARCORSYSCOM Service Approval	10 days	Tue 11/5/13	Mon 11/18/13																																													
17	Field Work	41 days	Fri 10/4/13	Fri 11/29/13																																													
18	ORR Site Prep	1 day	Fri 10/4/13	Fri 10/4/13																																													
19	Site Survey	2 days	Mon 10/7/13	Tue 10/8/13	18																																												
20	DGM Survey	8 days	Thu 10/10/13	Mon 10/21/13	19																																												
21	DGM REAC	3 days	Wed 10/30/13	Fri 11/1/13	20																																												
22	Utility Locate	1 day	Mon 11/4/13	Mon 11/4/13	24SS																																												
23	ORR Intrusive	1 day	Thu 10/31/13	Thu 10/31/13																																													
24	Orignal ESS DGM Intrusive Investigation and Soil Processing	15 days	Mon 11/4/13	Fri 11/22/13																																													
25	Amnd 1 ESS Soil Processing	5 days	Mon 11/25/13	Fri 11/29/13	24																																												
26	MDAS Shipping	0 days	Fri 11/29/13	Fri 11/29/13	25																																												
27	Technical Memorandum	45 days	Mon 12/2/13	Fri 1/31/14																																													
28	Draft	20 days	Mon 12/2/13	Fri 12/27/13	26																																												
29	Client Review	15 days	Mon 12/30/13	Fri 1/17/14	28																																												
30	Final	10 days	Mon 1/20/14	Fri 1/31/14	29																																												

Project: WE5A Schedule  
Date: Tue 12/3/13

Task

Split

Progress

Milestone

Summary

Project Summary

External Tasks

External Milestone

Deadline

Page 1



# Field Investigation Plan

---

## 3.1 Overall Approach

The purpose of this munitions response action is to identify and remove MEC and MPPEH prior to MILCON ground disturbance activities. MEC and MPPEH, if present, are assumed to be located within the approximate top 18 inches of native soil. The munitions response action will be conducted in two separate MRSs

- **MRS 1:** DGM will be conducted over 100 percent of 6.8 acres of the MRS (new roadway, buried utilities, and a fence) using an EM61-MK2 (**Section 3.4**). The geophysical anomalies identified as representing potential subsurface MEC will be intrusively investigated.
- **MRS 1A and 2:** Three piles of soil over 3.1 acres totaling approximately 200 cubic yards will be processed in lifts using mag-and-dig procedures (**Section 3.6.4**), then consolidated onsite.

After initial response (DGM, reacquisition, and intrusive investigation; and/or mag-and-dig) is completed, MILCON activities will be permitted to take place. If MEC or MPPEH is detected during MILCON activities, the need for further investigation using a lift approach (**Section 3.6.4**) will be evaluated. If deemed necessary, onsite or offsite construction support (**Section 3.14**) will be utilized during MILCON intrusive activities following the intrusive investigation of anomalies.

The equipment, approach, methods, operation procedures, and QC requirements for the subsurface clearance are detailed as follows.

## 3.2 Site Preparation and Restoration

The following subsections describe the procedures associated with site preparation, including mobilization of personnel and equipment, preparation for DGM surveying, and preparation for intrusive investigation activities.

### 3.2.1 Planning

The following actions require advanced planning and will be conducted prior to mobilization:

- Finalize procurement actions for items and services needed during the mobilization
- Hold a pre-mobilization meeting and Operations Readiness Review with the project team
- Coordinate with NAVFAC PM and Base Point of Contact on notification to local stakeholders of upcoming project activities
- Reconfirm documentation of proper training, certifications, and medical monitoring for site personnel

### 3.2.2 Mobilization

Mobilization will include identifying, briefing, and mobilizing staff, as well as securing and deploying equipment.

#### General Activities

- Identify, procure, package, ship, and inventory project equipment, including geophysical instrumentation, hand tools, and supplies
- Coordinate with local agencies, including MCIEAST-MCB CAMLEJ, police, hospital, and fire departments as appropriate
- Coordinate communications and other logistical support

- Test and inspect equipment
- Conduct site-specific training on the Work Plan Addendum and MEC procedures and hazards
- Review subcontractor Activity Hazard Analysis forms
- Verify that all forms and project documentation are in order and project team members understand responsibilities regarding project reporting requirements

### **Kickoff and Safety Meeting**

During mobilization, a kickoff and site safety meeting will be conducted that will include a review of this Work Plan Addendum and the HSP by all site personnel. Additional meetings will occur as needed when new personnel, visitors, and/or subcontractors arrive at the site.

### **3.2.3 Buried Utility Clearance**

Prior to initiating any intrusive activities, the North Carolina One Call Center will be contacted to identify and mark subsurface utilities. A record of each utility-locating ticket will be retained to verify that North Carolina One Call was contacted.

CH2M HILL will coordinate with Base personnel and a third-party utility-locating subcontractor to define subsurface structures that could be impacted by intrusive activities. The third-party utility locator will be contracted to mark utilities within a 20-foot radius of MCAS New River – Runway Expansion Area. No intrusive activities will be conducted until utility mark-out verification is complete and no conflicts with subsurface utilities are identified.

CH2M HILL will also coordinate with the Department of the Navy's Officer In-Charge of Construction to confirm that no new utilities have been recently installed.

### **3.2.4 Site Survey**

Land surveying activities will be conducted in accordance with Section 7.4 of the MRP Master Project Plans (CH2M HILL, 2008). Land surveying activities will be conducted by a Professional Land Surveyor registered in the State of North Carolina. Land surveying will include identification and marking of the MCAS New River – Runway Expansion Area boundary, layout of grids, and/or similar tasks. Survey activities may require the placement of stakes or pin flags in the ground for fiducial positioning. UXO technicians will escort surveying personnel while onsite and will clear all locations where stakes are driven.

### **3.2.5 Site Restoration and Demobilization**

#### **Site Restoration**

Ground surface damage (such as deep ruts) caused by equipment or other site activities will be repaired and re-vegetated as necessary to prevent erosion.

#### **Demobilization**

Full demobilization will occur when the project is completed and appropriate quality assurance and QC checks have been performed. The following activities will occur prior to demobilization:

- Confirmation that DGM is complete
- If environmental samples are collected, chain-of-custody records will be reviewed to ensure that all field and QC samples were collected as required and were submitted for appropriate analyses
- Verification that all DGM-selected anomalies have been investigated
- Verification that MEC investigation extended to the maximum depth of MILCON excavation and that all stockpiled soil has been processed for MEC and MPPEH hazards
- Verification of adequate site restoration

- All field equipment will be inspected, packaged, and shipped to the appropriate location

### 3.3 Anomaly Avoidance

Due to the potential of MEC and MPPEH being present onsite, anomaly avoidance procedures will be followed during all site preparation activities and the DGM survey. The site is currently a grass field maintained by MCIEAST-MCB CAMLEJ, so a UXO escort providing anomaly avoidance is needed for intrusive activities only. The MEC and Anomaly Avoidance SOP within **Appendix D** provides details on avoidance operations.

### 3.4 Geophysical Investigation Plan

#### 3.4.1 Geophysical Investigation Approach

DGM will be performed to identify subsurface anomalies that represent potential subsurface MEC. DGM will be conducted over all 6.8 acres of MRS 1, as shown on **Figure 3-1**. The DGM will be conducted using a single-coil Geonics EM61-MK2 instrument. The EM61-MK2 is a high-resolution, time-domain electromagnetic instrument designed to detect, with high spatial resolution, ferrous and non-ferrous metallic objects.

DGM will not be performed on MRS 1A and 2. Instead, mag-and-dig activities will be performed on the soil stockpiles. DGM will also not be performed over the areas beneath and around the stockpiles used for processing the soil during mag-and-dig operations. **Section 3.6.4** describes mag-and-dig activities in detail.

The GIP provided in **Appendix A** provides details of the equipment, approach, methods, standard operational procedures, and QC steps for the geophysical investigation.

#### 3.4.2 Geophysical Systems Verification

A GSV will be performed to validate the geophysical instruments to be utilized during the DGM activities. The GSV is a physics-based, presumptively selected technology process in which signal strength and sensor performance are compared to known response curves of industry standard objects to verify the performance of DGM systems before and during site surveys. The GSV process is designed to perform initial verification of the DGM system using an instrument verification strip, followed by a blind seeding program for continued verification throughout the field operations. The GSV Plan is provided in **Appendix B**.

### 3.5 Geospatial Information and Electronic Submittals

Methods, equipment, accuracy, and submittal requirements for location surveys and mapping are described in Section 7.4 of the MRP Master Project Plans (CH2M HILL, 2008).

### 3.6 Munitions and Explosives of Concern Investigation

#### 3.6.1 Investigation Approach

The MEC investigation approach will consist of digital and analog detection of subsurface MEC and MPPEH. After the initial munitions response activities (DGM, reacquisition and intrusive investigation, and/or mag-and-dig) are completed, construction activities will be permitted to take place. If MEC or MPPEH is detected during construction activities, the need for further investigation using the approach identified in **Section 3.6.4** will be evaluated. This evaluation will consider the type(s) of MEC and MPPEH and the manner in which it was emplaced at this depth (impact penetration or dropped and then covered with fill, buried by erosion or ground disturbance, and so forth) based on evidence such as other debris, soil type compared to native soil, evidence of ground disturbance, orientation of the MEC and MPPEH, item, and so forth. If this evaluation indicates a moderate to high probability of additional MEC being found, the lift approach in **Section 3.6.4** will be implemented to the expected depth of buried MEC and MPPEH or to the maximum planned depth of MILCON ground disturbance, whichever is less. This evaluation, if required, will also be used to determine the need for onsite or offsite construction support as defined in **Section 3.14**. The determination of whether mag-and-dig in lifts or construction support is needed will be conducted by

Project Geophysicist and a munitions response QC and/or H&S Officer, and then approved by the NAVFAC RPM and MCIEAST-MCB CAMLEJ Base Environmental Management. The MCIEAST-MCB CAMLEJ Explosives Safety Officer may provide technical support or endorsement to NAVFAC and MCIEAST-MCB CAMLEJ.

Mag-and-dig activities will also be conducted on the stockpiled soil.

### 3.6.2 Digital Geophysical Mapping Anomaly Reacquisition

Geophysical anomalies identified for investigation will be reacquired to an exact location using a real-time kinematics global positioning system or a robotic total station. If the anomaly is not immediately intrusively investigated, the location will be flagged using a polyvinyl chloride (PVC) flag with the unique identifier number recorded in indelible ink. The location will be flagged 1-foot north of the actual field location of each reacquired anomaly.

### 3.6.3 Intrusive Investigation

Excavation of individual geophysical anomalies will be performed by UXO technicians using hand-excavation tools. The UXO teams performing this work will be composed of at least one UXO Technician II and up to four UXO Technicians II or I supervised by a UXO Technician III. The SOPs for this work will be provided by the subcontractor once procured. The following basic technique will be used for anomaly excavation:

- The UXO technician will investigate 1-foot south of the emplaced flag with the assistance of a Schonstedt GA-52Cx (or equivalent) to pinpoint the anomaly source. The UXO technician will investigate all Schonstedt GA-52Cx (or equivalent) detections within a 1-meter radius of the DGM-detected anomaly location (1-foot south of flag).
- Until identified otherwise, the anomaly source is assumed to be MEC. Excavation will be initiated adjacent to the subsurface anomaly. The excavation will continue until the excavated area has reached a depth below the top of the anomaly as determined by frequent inspection with an appropriate geophysical instrument.
- Using progressively smaller and more delicate tools to remove the soil carefully, the excavation team will expand the sidewall to expose the metallic item for inspection and identification without moving or disturbing the item.
- Once the item is exposed for inspection, the excavation team will determine whether the item is MEC, MPPEH, or other debris.
  - If the item is MEC, a positive identification will be documented and confirmed by another UXO technician. If confirmed, the MEC item will be disposed of by blow-in-place (BIP) methods, or, if the item is safe to move (as confirmed by the Senior Unexploded Ordnance Supervisor [SUXOS] and Unexploded Ordnance Safety Officer [UXOSO]), the item may be moved for controlled detonation and/or consolidation. For MEC, including suspect munitions items, the SUXOS and UXOSO must determine that the risk associated with movement is acceptable and that the movement is necessary for the efficiency of the activities being conducted or the protection of people, property, or critical assets. In such cases, the responsible SUXOS and UXOSO must agree with the risk determination and document this decision in writing prior to movement of the MEC or suspected munitions item. UXO-qualified personnel may determine that MPPEH is safe for onsite movement. Written documentation and concurrence of the UXOSO is not required.
  - Following demolition and removal of the MEC, MPPEH, or other debris, the excavation team will then record the results of the excavation.
  - If the item is other debris, it will be collected and segregated away from MPPEH.
  - If the item is MPPEH, the procedures presented in **Section 3.7** will be followed.

- Once all the Schonstedt GA-52Cx (or equivalent) detections within the 1-meter radius of the DGM-identified anomaly location have been investigated, the 1-meter radius will be checked with an EM61-MK2 to ensure that another item was not hidden beneath the removed item(s). If additional items remain, the anomaly investigation process will restart.

### 3.6.4 Mag-and-Dig

Mag-and-dig activities will be conducted on the stockpiled soil within MRS 1A and 2. In areas of planned MILCON soil disturbance where MEC/MPPEH are expected to exist deeper than the depth of DGM detection within MRS 1, mag-and-dig in lifts may also be performed as described in **Section 3.6.1**.

A Schonstedt GA-52Cx or equivalent will be used in the mag-and-dig process to identify subsurface metallic anomalies. The Schonstedt GA-52Cx is a handheld analog magnetometer that detects ferrous objects and ferromagnetic minerals. The instrument provides an audible signal representing the magnitude and direction of the local magnetic field. In application, the operator sweeps the instrument back and forth in the area of interest and monitors the change in pitch of the sound emanating from the instrument. The change in pitch is the magnetometer response to a secondary magnetic field produced by a ferrous metallic item in the area of interest. Non-ferrous MEC and MPPEH items are not anticipated to be present, but if any are discovered during the investigation, an all-metals metal detector will be used.

Following the investigation of DGM selected anomalies and/or the initial analog mag-and-dig event, the top 2 feet of soil may be mechanically removed if the MILCON excavation is planned to extend beyond this depth. The thickness of the lift may be reduced if the Project Geophysicist determines that smaller ordnance items were not detected and removed during the investigation of the DGM-selected anomalies and/or mag-and-dig activities.

Once the soil has been mechanically removed, UXO technicians will perform another mag-and-dig scan on the floor of the excavation or side of a soil stockpile as appropriate. If the UXO technician detects any subsurface anomalies, they will investigate the anomaly as detailed previously. This process will be repeated until the stockpiled soil has been inspected or if needed, the maximum planned MILCON excavation depth is reached.

The final depth of excavation will be dictated by the MCIEAST-MCB CAMLEJ Officer In-Charge of Construction, Construction Manager.

### 3.6.5 Removal Verification

The following procedure will be adhered to for QC inspections of the intrusive investigation:

- After the dig team intrusively investigates an anomaly location, the hole is to be left open to the depth investigated and the PVC flag bent after the investigation is completed.
- The Unexploded Ordnance Quality Control Specialist (UXOQCS) will inspect the minimum number of anomalies as specified in **Section 3.9** using an EM61-MK2 or Schonstedt GA-52Cx geophysical instrument (DGM anomalies will be checked with an EM61-MK2 and analog-detected [mag-and-dig] anomalies will be checked with a Schonstedt GA-52Cx) to determine whether all detectable metallic items within a 1-meter radius of the hole have been removed. The locations checked will be distributed in a spatially representative sample across each grid.
- All holes related to intrusive investigations will be filled to original grade or covered before departing the project site each day.
- Anomaly locations inspected, along with results of the inspection and corrective actions planned in the event that the UXOQCS determines that inspection results require a change in intrusive team procedures or a re-performance of any work, will be documented and provided to the CH2M HILL Project Geophysicist.

Additional QC analysis of intrusive results versus original amplitude of geophysical anomalies may be performed by the CH2M HILL Project Geophysicist. Anomaly locations that are determined to need re-investigation through this process will be re-inspected.

### 3.7 Procedures for Reporting and Disposition of Munitions and Explosives of Concern and Material Potentially Presenting an Explosive Hazard Items

This section discusses the procedures for reporting and disposing of MEC and MPPEH items encountered during the project, including the responsibilities of personnel, overall safety precautions, data reporting, transportation, safe holding areas, operations in populated and/or sensitive areas, demolition operations, and required engineering controls and exclusion zones (EZs) for intrusive operations and intentional detonations. The general responsibilities of project personnel are described in Section 2.5 of the MRP Master Project Plans (CH2M HILL, 2008).

#### 3.7.1 Overall Safety Precautions

The overall safety precautions described in Section 2.5.1 of the MRP Master Project Plans (CH2M HILL, 2008) will be adhered to during the intrusive investigation.

Qualified UXO personnel will dispose of all MEC items (including MPPEH and material documented as an explosive hazard items) using explosive demolition procedures by countercharging these items with an explosive donor charge and detonating the donor charge. This will be performed by a demolition team consisting of one UXO Technician III as the Demolition Supervisor and two UXO Technician II personnel, with the SUXOS responsible for the operation.

#### 3.7.2 Data Reporting

Data reporting for each metallic anomaly will be done in accordance with Section 2.5.2 of the MRP Master Project Plans (CH2M HILL, 2008).

#### 3.7.3 Operations in Populated and Sensitive Areas

Operations will not be conducted in populated areas.

Sensitive habitats include jurisdictional wetlands and habitat for threatened and endangered species. MEC operations in these areas will be conducted in accordance with the EPP (**Section 7**) to be protective of these sensitive areas and all threatened and endangered species. Sensitive areas are not present at the MRA.

#### 3.7.4 Exclusion Zones and Separation Distances

The primary munition with the greatest fragmentation distance (MGFD) was used to calculate the explosives safety-quantity distance (ESQD) arcs for the site. EZs, which include the team separation distance for personnel conducting intrusive operations within the MRSs, the minimum separation distance for non-essential personnel, the public transportation route distance, and the inhabited building distance for bare explosives and MPPEH under specified scenarios, are provided in the ESS, where applicable. **Figures 3-2** and **3-3** are the ESQD arcs for the MRSs from the ESS.

If MEC with a larger munitions fragmentation distance than the primary MGFD is found, the contingency MGFD will be used. If the contingency MGFD ESQD arcs are implemented, MARCORSYSCOM will be notified using the *MRS Identification and Notification Report* in Naval Ordnance Safety and Security Activity Instruction 8020.15C (NOSSA, 2011).

If the new item's MGFD is larger than the contingency MGFD, work at the site will stop and an ESS amendment will be submitted for that site.

### **3.7.5 Munitions and Explosives of Concern and Material Potentially Presenting an Explosive Hazard Hazards Classification, Storage, and Transportation**

MEC and MPPEH will be classified and transported as discussed in Section 2.6 of the MRP Master Project Plans (CH2M HILL, 2008). MEC will not be stored. MPPEH will be stored at the MPPEH Collection Point specified in the ESS, as discussed in Section 2.6 of the MRP Master Project Plans (CH2M HILL, 2008). All MEC and MPPEH will be classified as class/division 1.1. MEC and MPPEH will not be transported offsite.

A systematic approach will be used for collecting, inspecting, and segregating site debris. The approach is designed so that materials undergo a continual evaluation and inspection process from the time they are acquired until the time they are removed from the site. Segregation procedures begin at the time the item is discovered by the UXO technician. At this point, the UXO technician makes a preliminary determination as to the classification of the item into one of three categories, and the UXO Technician III confirms the item to be MEC, MPPEH, or other debris.

MPPEH that has undergone two 100 percent visual inspections by two UXO Technician IIIs who are independent of each other in the reporting chain and are authorized to sign the Requisition System Document (DD Form 1348-1) as not presenting an explosive hazard is considered to be material documented as safe (MDAS). MDAS will be stored in a locked container at least 50 feet from the MPPEH collection point. MDAS and other debris may be transported offsite via a DD Form 1348-1.

### **3.7.6 Munitions and Explosives of Concern Disposition**

MEC and MPPEH will be demilitarized by BIP methods or will be relocated for demolition if it is determined to be safe to do so by the SUXOS and UXOSO.

### **3.7.7 Material Potentially Presenting an Explosive Hazard Disposition**

MPPEH will be visually inspected and independently re-inspected for explosive hazards as discussed in Section 2.7.2 of the MRP Master Project Plans (CH2M HILL, 2008). MPPEH that cannot be classified as MDAS will be disposed of in the same manner as MEC.

### **3.7.8 Recording, Reporting, and Implementation of Lessons Learned during the Project**

Lessons learned will be performed in accordance with Section 2.7 of the MRP Master Project Plans (CH2M HILL, 2008).

## **3.8 Quality Control Seed Recovery Verification**

The following procedure will be followed for QC seed recovery verification:

- Prior to the start of the intrusive investigation of a grid, the UXOQCS will determine whether a QC seed item has been placed within that grid.
- At the conclusion of each day's activities when a seeded grid is being intrusively investigated, the UXOQCS will review the dig results for that day and confirm that all QC seed items have been recovered, if any targets containing QC seed items were dug on that day.
- Immediately upon completion of intrusive activities within a seeded grid, the UXOQCS will review the dig results for that grid and confirm that all seed items were recovered from the seeded grid.
- If a QC seed is not recovered when the associated target has been investigated, that will be considered a QC failure and a Root-Cause Analysis and Corrective Action Request will be initiated.

## 3.9 Grid Completion Verification

Upon completion of the intrusive investigation of all targets within a unit of investigation (such as a grid or group of grids, as appropriate for the site), the UXOQCS will perform a QC check on a statistically significant sample of the targets according to the following process:

- A subset of the “digsheet” anomalies will be selected using the **Item Sampling** tool in the Visual Sampling Plan (VSP) statistical sampling software (Battelle, 2011) to determine the number of randomly selected anomalies that are required to ensure a 95 percent confidence that 95 percent of the remaining anomalies (those not selected for QC check) are acceptable. The anomaly subset will be generated by either the project geophysicist or the site manager. Each “digsheet” anomaly will be assigned a random number (through Microsoft Excel or another random number generating method) and the anomalies will be sorted according to the random number assigned (by ascending value). The quantity of anomalies for QC inspection, selected from the top of the list, will be based on the VSP-calculated quantity.
- The project geophysicist or the site manager will provide the UXOQCS with a list of the target numbers of the randomly selected targets that will be QC inspected. The UXOQCS will inspect each randomly selected target using the same type of geophysical device that was used for the DGM effort. The UXOQCS will use the geophysical device to observe the strength of the geophysical response at the coordinates of the target and, if the location was supposed to be cleared to background levels established for the site, or if the geophysical response is greater than background, then the following step will be initiated. If the strength of the response is appropriate for the site background, then the QC inspection for that location is complete. The UXOQCS has the authority to inspect more targets than those that were randomly selected if warranted.
- The UXOQCS will inspect a 1-meter radius around the target coordinates using the same type of geophysical device that was used for the DGM effort and, if needed, a Schonstedt GA-52Cx or handheld all-metals detector (such as a White’s XLT). Hand digging will be conducted at all locations where the presence of buried metal is indicated. The UXOQCS will record the results of all items that are recovered during the QC inspection. If any pieces of metal greater than 1-square inch are recovered, that will be considered a QC failure of the grid and a Root-Cause Analysis will be initiated.
- The dig team will re-investigate all targets within a unit of investigation where a QC failure has occurred and the QC process will be repeated for that unit.

## 3.10 Field Sampling Plan

### 3.10.1 Field Operations

Environmental sampling will be required if either of the following conditions is met during the investigation at each MRS:

- MEC and MPPEH with exposed filler is identified
- Controlled detonation is performed

For discovered MEC and MPPEH and controlled detonations, the Crater Sample approach will be used. The Outside the Crater approach will only be used for controlled detonation.

### Post-Detonation Surface Soil Sampling

Two post-detonation soil samples will be collected at each detonation location: one sample from the crater created by the detonation, and one sample from the area of ejected soil around the detonation crater. The methods for collecting these samples are provided as follows.



### **Crater Samples**

The surface soil sample from the crater will be collected using the TR-02-1 approach (Thiboutot et al., 2002). Each sampling location will be defined as an area measuring 1 meter × 1 meter. Coordinates of the sampling locations will be based on the center of the sampling area. Soil samples will be collected by compositing a minimum of 30 sample increments from random locations within each 1-meter × 1-meter sampling location. The sample increments will be approximately equal in the amount of soil, which will be collected from depths of 0 to 2 inches bgs. The sample increments at each location will be composited into a single sample following the Homogenization of Soil and Sediment Samples SOP in Appendix D of the MRP Master Project Plans (CH2M HILL, 2008) prior to being transferred to the appropriate sample containers.

### **Outside the Crater**

The surface soil samples from outside the crater will be collected utilizing the incremental sampling method. The decision unit for the post-BIP sample collected outside the crater (outside the 1-square-meter TR-02-01 sampling area) will be roughly circular and centered upon the crater, with a radius of up to 15 meters to encompass the visible ejection pattern. The maximum radius of 15 meters is based on work conducted by the United States Army Engineer Research and Development Center entitled “Explosive Residues from Blow-in-Place Detonations of Artillery Munitions” (Pennington et al., 2008). This paper concluded that the majority of the explosives residue mass falls within 15 meters of the detonation center. At least 30 aliquots of soil will be collected from 0 to 2 inches bgs and homogenized in accordance with the SOP in Appendix D of the MRP Master Project Plans (CH2M HILL, 2008).

### **Exposed Filler Soil Sampling**

If filler is suspected to have leaked from discovered MEC and MPPEH, a soil sample will be collected from the soil at that location after the MEC and MPPEH have been removed. The soil sample will be collected following the previously described method for post-detonation crater sampling, with the sampling area centered on the location of the MEC and/or MPPEH item. If the MEC and/or MPPEH item is not safe to move and must be destroyed via BIP methods, only post-detonation samples will be collected.

### **Analytical Parameters**

All soil samples from post-detonation and exposed filler sampling will be analyzed by a fixed-base laboratory for the following parameters:

- Explosives residues (nitroaromatics and nitramines), including pentaerythritol tetranitrate and nitroglycerin (United States Environmental Protection Agency [USEPA] SW-846 Methods 8330A and SW-846 8332)
- Perchlorate (USEPA SW-846 Method 6850)
- Total metals (USEPA SW-846 Method 6010C/6020A/7471A)
- Hexavalent chromium (USEPA SW-846 Method 7199)

### **3.10.2 Investigation-Derived Waste Management**

All investigation-derived waste generated during the investigation will be managed in accordance with the current version of the MCIEAST-MCB CAMLEJ *Investigation and Remediation Waste Management Plan* (CH2M HILL, 2013).

## **3.11 Health and Safety Plan**

The HSP is provided in **Appendix C**.

## **3.12 Data Management**

Documentation and processing of field data, lab data, and investigation results will be completed in accordance with Section 7.2 of the MRP Master Project Plans (CH2M HILL, 2008).

### **3.13 Project File Requirements**

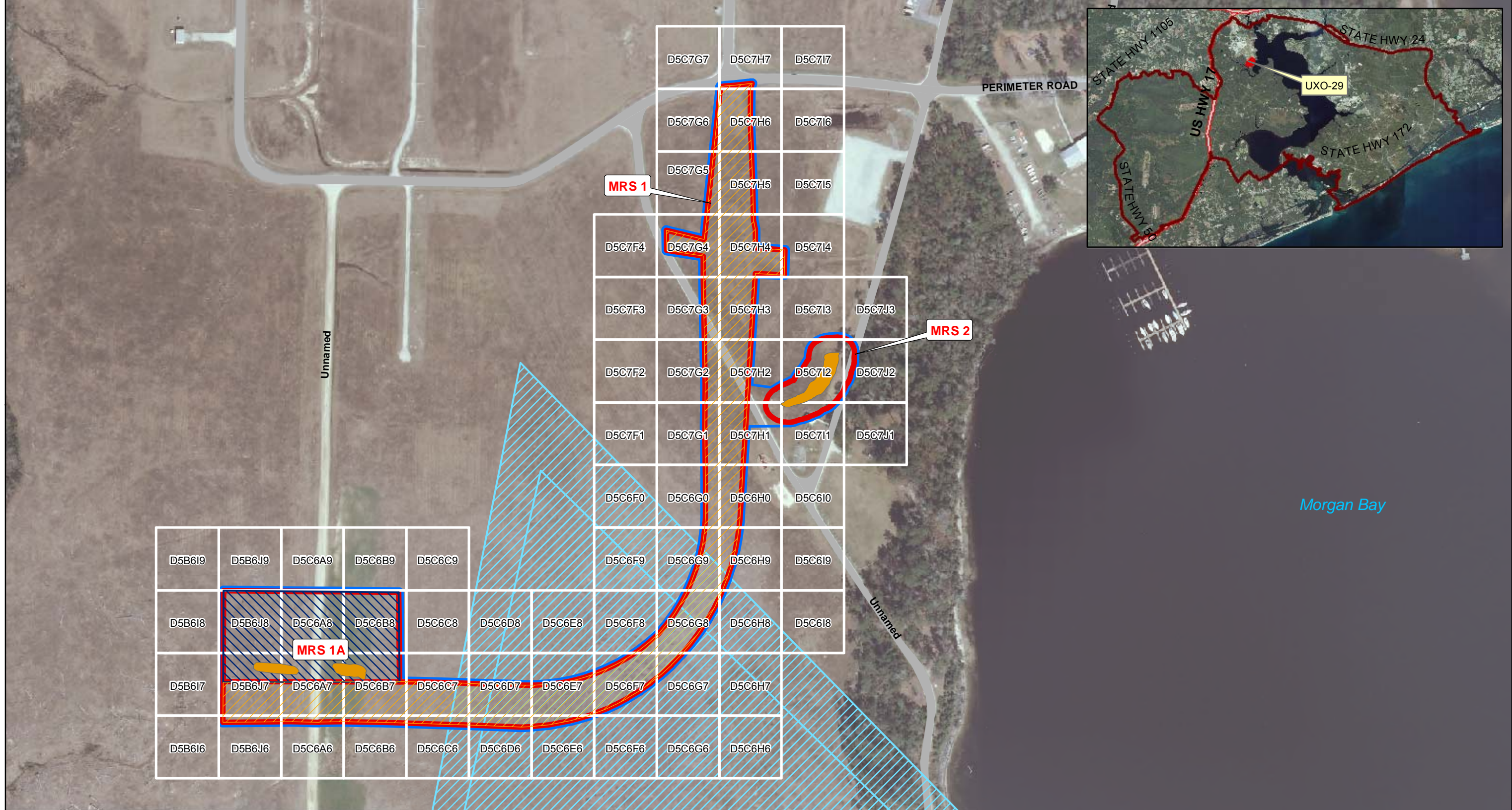
This project will require the administration of a central project file. Project data and records will be managed in accordance with Section 7.3 of the MRP Master Project Plans (CH2M HILL, 2008).

### **3.14 Construction Support**

If deemed necessary, CH2M HILL will provide onsite or offsite construction support during MILCON ground-disturbing activities. Construction support will be performed in accordance with Naval Sea Systems Command Ordnance Pamphlet 5, Volume 1, 7th Revision Section 14-10.3 (NAVSEA, 2011).

If onsite construction support is utilized, a UXO technician will be onsite evaluating all ground disturbance activities. For offsite construction support, a UXO technician or Base EOD response will be requested if suspected MEC/MPPEH is encountered.

If while conducting construction support, MEC and MPPEH are encountered, the NAVFAC PM will be notified and an evaluation will be performed to determine whether construction support is to be suspended or further investigation is needed ahead of MILCON activities.



**Legend**

- Stockpiled Soil
- 50 meter grid
- DGM
- Stockpiled Soil Area
- B-17, Former Infantry Weapons Demonstration Course
- MRS Boundary
- MRA Boundary

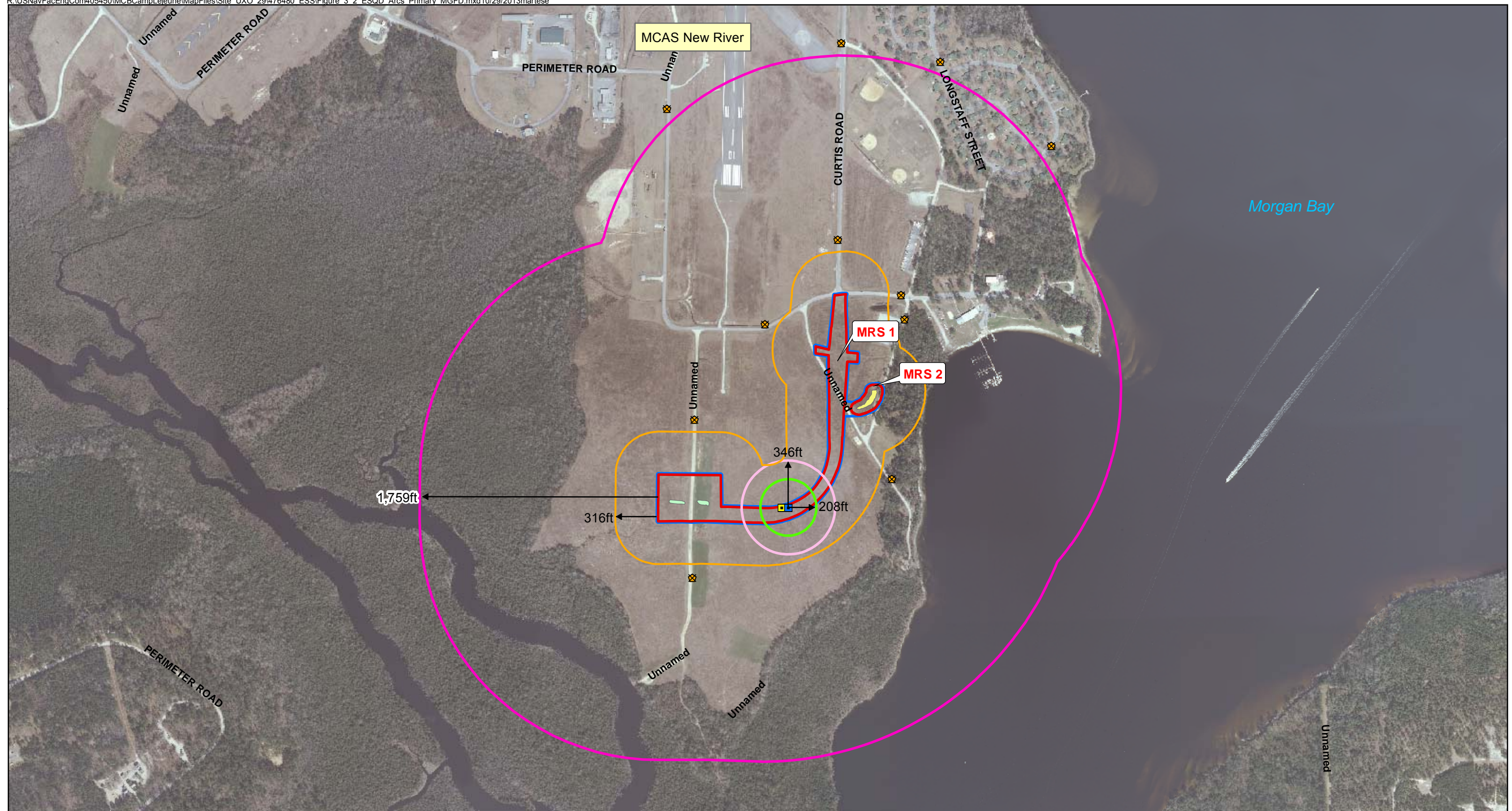
0 125 250 500 Feet

1 inch = 250 feet

Figure 3-1  
DGM Soil Pile Map  
Work Plan Addendum for MCAS New River-Runway Expansion Area  
MCIEAST-MCB CAMLEJ  
North Carolina

CH2MHILL





# Legend

- ✕ Road Blocks
- MPPEH Collection Point
- MDAS Collection Point
- MPPEH Collection Point PTR EZ (208 ft)
- MPPEH Collection Point IBD, EZ (346 ft)
- Unintentional Detonation EZ, Public and Non-Essential Personnel (316 ft)
- Intentional Detonation EZ, All Personnel (1,759 ft)

- Stockpiled soil from MILCON activities that may contain MEC/MPPEH
- Additional Stockpiled Soil
- MRS Boundary
- MRA Boundary

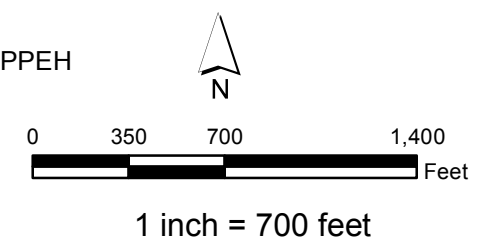
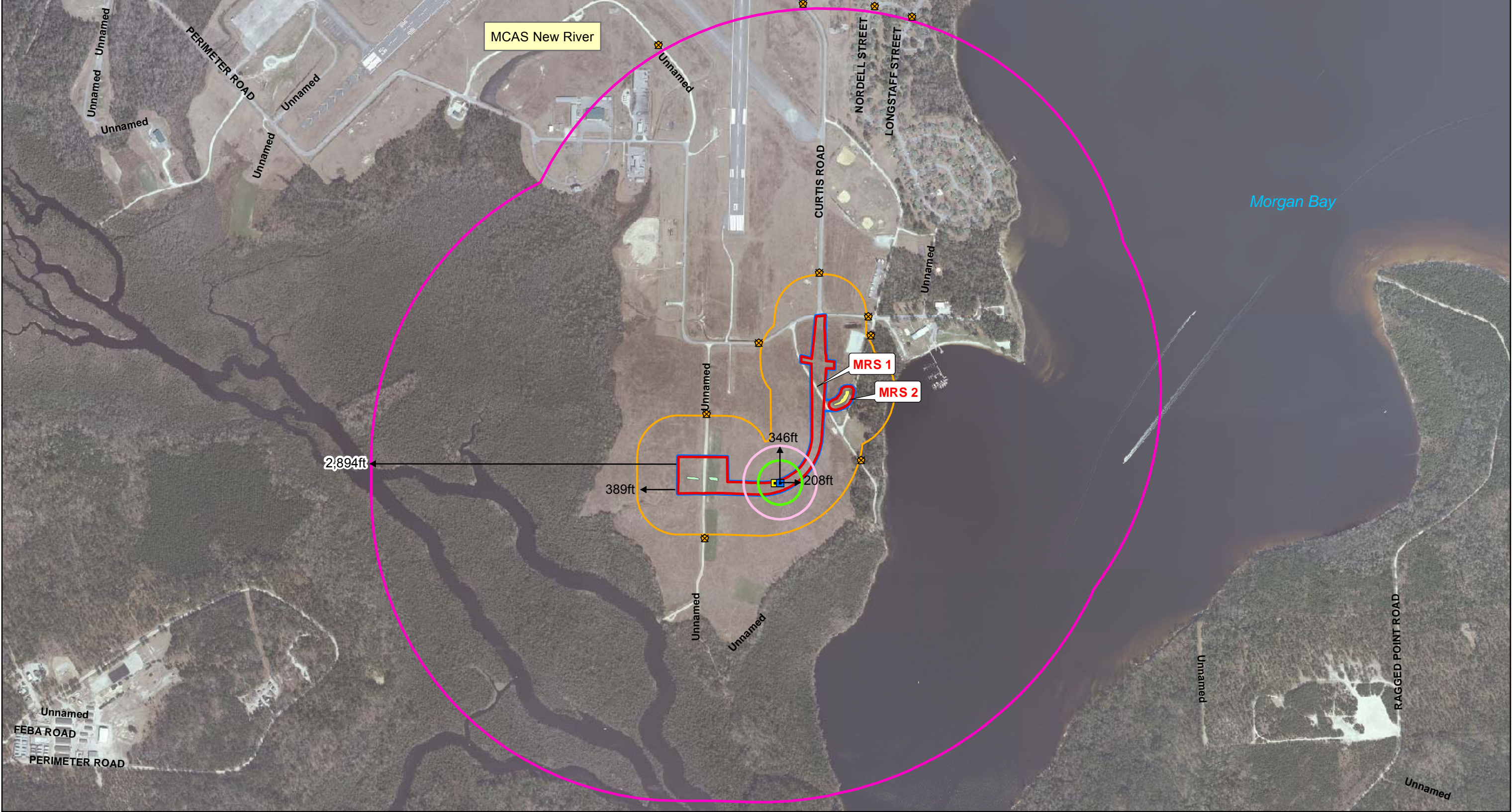


Figure 3-2  
ESQD Arcs for the Primary MGFD  
MCAS New River Runway Expansion Area ESS  
MCIEAST-MCB CAMLEJ  
North Carolina





**Legend**

- ✦ Road Blocks
- MPPEH Collection Point
- MDAS Collection Point
- MPPEH Collection Point PTR EZ (208 ft)
- MPPEH Collection Point IBD, EZ (346 ft)
- Unintentional Detonation EZ, Public and Non-Essential Personnel (389 ft)
- Intentional Detonation EZ, All Personnel (2,894 ft)

- Stockpiled soil from MILCON activities that may contain MEC/MPPEH
- Additional Stockpiled Soil
- MRS Boundary
- MRA Boundary

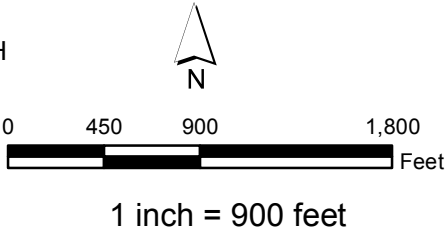


Figure 3-3  
ESQD Arcs for the Contingency MGF.D  
MCAS New River Runway Expansion Area ESS  
MCIEAST-MCB CAMLEJ  
North Carolina



#### SECTION 4

## Explosives Management Plan

---

The management of explosives to support the removal and disposal of MEC and MPPEH items that may be discovered during the investigation at MCAS New River – Runway Expansion Area will be done in accordance with Section 3 of the MRP Master Project Plans (CH2M HILL, 2008).

## SECTION 5

# Explosives Siting Plan

---

Explosives safety criteria for planning and siting explosives operations for the MEC intentional detonation operations at the site are provided in Section 4 of the MRP Master Project Plans (CH2M HILL, 2008). There are no planned or established MEC detonation areas. In accordance with the approved ESS, MEC and MPPEH will be destroyed by BIP methods where found, or MEC and MPPEH may be relocated for demolition if determined safe to do so by the SUXOS and UXOSO.

## SECTION 6

# Quality Control Plan

---

All applicable work conducted by CH2M HILL and its subcontractors at the subject sites will be performed in accordance with the QCP in Section 8 of the MRP Master Project Plans (CH2M HILL, 2008). The QCP describes the QC approach and procedures to be employed during the intrusive investigation at the sites.

The specific QC audit procedures for the definable features of work to be employed at the subject sites, including the phase during which it is performed, the frequency of performance, the pass/fail criteria, and actions to take if failure occurs, are presented in **Table 6-1**. QC forms and checklists are provided in **Appendix E**.



# Environmental Protection Plan

---

This EPP is a supplement to the MCIEAST-MCB CAMLEJ Master EPP (Section 9 of the MRP Master Project Plans [CH2M HILL, 2008]) and provides additional site-specific details related to the environmental protection procedures to be implemented at the MRA. Only additional details, modifications, or additions to the information provided in the EPP from the MRP Master Project Plans are discussed herein.

## 7.1 Regional Ecological Summary

A summary of the regional ecology is provided in Section 9.1 of the MRP Master Project Plans (CH2M HILL, 2008).

## 7.2 Endangered and Threatened Species within the Project Site

Many protected species have been sighted at and in the vicinity of MCIEAST-MCB CAMLEJ, species such as American alligator, green sea turtle, loggerhead sea turtle, piping plover, red-cockaded woodpecker (RCW), seabeach amaranth, and rough-leaf loosestrife (USMC, 2006). **Table 7-1** lists the species that could occur at or adjacent to MCIEAST-MCB CAMLEJ that are listed as threatened, endangered, or of special concern by the United States Fish and Wildlife Service (USFWS) under the Endangered Species Act of 1973, as amended. Based on the environmental reviews completed in preparation for the Integrated Natural Resource Management Plan, none of the species listed in **Table 7-1** are expected at the site; therefore, no adverse impacts to listed species are expected to result from the proposed work. If any of the listed species are encountered at the site, operations will stop and the CH2M HILL PMs and Environmental Managers (EMs) will be notified. Operations will not resume until it is determined whether the species is protected and, if so, what actions must be taken to remain in compliance.

## 7.3 Migratory Birds within the Project Site

The federal Migratory Bird Treaty Act (MBTA) protects listed birds, as well as their eggs and active nests (nests containing eggs or non-fledged young). While it is unlikely that migratory birds will be present at the site, North Carolina is located in the Atlantic Migratory Flyway and migratory birds could be present at any time. Destruction of the birds, nests, or eggs by site operations is prohibited by the MBTA. If nesting birds, nests (active or inactive), or eggs are encountered at the site, operations will stop and the CH2M HILL PMs and EMs will be notified. Operations will not resume until it is determined whether the bird is protected and, if so, what actions must be taken to remain in compliance.

## 7.4 Wetlands within the Project Site

According to the wetland information in the MCIEAST-MCB CAMLEJ Geographical Information System database, a small area of jurisdictional wetlands is located within the southern boundary of the site (**Figure 7-1**). Work in wetland areas will be avoided to the extent practical. However, if site activities must be performed within the wetlands, any excavated areas will be refilled with soil and re-vegetated as needed. It is not anticipated that CH2M HILL and/or subcontractors will be performing any work that will result in land disturbance greater than 1 acre. Therefore, no controls related to erosion or sedimentation control are expected to be necessary.

## 7.5 Cultural and Archaeological Resources within the Project Site

The probability that any significant cultural or archeological resources will be impacted by the field investigation is low. If any unmapped cultural or archaeological materials or resources are discovered within the project investigation area, the EM will be notified and asked to provide guidance on performing further work in the area.

## 7.6 Water Resources within the Project Site

As shown on **Figure 7-1**, the area of investigation does not encompass, nor is it bounded or bordered by, surface water bodies. Morgan Bay is located approximately 600 feet east of the project site. No water resources are expected to be impacted by the project.

## 7.7 Vegetation to be Removed within the Project Site

No vegetation clearance will be conducted. The site contains low-cut grass that is maintained by the Base.

In the event that plant species are encountered that are listed by the USFWS as threatened or endangered, the EM will be notified and asked to provide guidance on performing further work in the area.

## 7.8 Existing Waste Disposal Sites within the Project Site

No known waste disposal sites are present within the area of investigation.

## 7.9 Compliance with Applicable or Relevant and Appropriate Requirements

CH2M HILL will follow all applicable regulations concerning environmental protection, pollution control, and abatement for the proposed project work as described in Section 9.3 of the MRP Master Project Plans (CH2M HILL, 2008). No permits have been determined to be required for the proposed work.

## 7.10 Spill Prevention and Control

Procedures and controls regarding spills can be found in the Accident Prevention Plan. The CH2M HILL Site Manager will report any release of any potentially hazardous waste, chemical, or material to the CH2M HILL PM and EM or their designated representative. All spills will also be reported to the Base, according to the direction given by the EM and the PM. The definition of release includes any, “spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the environment (including the abandonment or discarding of barrels, containers, and other closed containers) of any potentially hazardous chemical, substance, and/or material.”

## 7.11 Detailed Procedures and Methods to Protect and/or Mitigate the Resources and Sites Identified

During the proposed work, a general survey of the project area will be conducted by the field personnel to identify obvious environmental concerns. The PM and EM, in conjunction with an ecologist, will provide instructions to field personnel regarding the protection of onsite environmental resources. Such protective measures will include, but are not limited to, the following:

- Should a federally protected plant species be identified within the project area, specimens will be flagged for easy relocation and verification
- Should cultural or archaeological material or resources be discovered within the project area, the MCIEAST-MCB CAMLEJ archaeologist will be notified to provide guidance on performing further work in the area
- The PM and/or EM will seek the guidance of an ecologist to determine appropriate mitigation measures in the event that work activities impact an environmental resource

TABLE 7-1

**Species Potentially Occurring on or Adjacent to MCIEAST-MCB CAMLEJ, in Onslow County, Listed as Threatened, Endangered, or of Special Concern by USFWS***Site-Specific Work Plan**MCAS New River – Runway Expansion Area**MCIEAST-MCB CAMLEJ, North Carolina*

Scientific Name	Common Name	Federal Status	Habitat
<i>Anguilla rostrata</i>	American eel	FSC	The American eel is catadromous; it spawns in oceanic waters but uses freshwater and brackish and estuarine systems for most of its developmental life. Migrates in autumn to the Sargasso Sea to spawn. Occurs usually in permanent streams with continuous flow. Hides during the day in undercut banks and in deep pools near logs and boulders.
<i>Chelonia mydas</i>	Green sea turtle	T	Green turtles are generally found in fairly shallow waters (except when migrating) inside reefs, bays, and inlets. The turtles are attracted to lagoons and shoals with an abundance of marine grass and algae. Open beaches with a sloping platform and minimal disturbance are required for nesting.
<i>Caretta caretta</i>	Loggerhead sea turtle	T	The loggerhead is widely distributed within its range. It may be found hundreds of miles out to sea, as well as in inshore areas such as bays, lagoons, salt marshes, creeks, ship channels, and the mouths of large rivers.
<i>Dermochelys coriacea</i>	Leatherback sea turtle	E	An open-ocean species, it sometimes moves into shallow bays, estuaries, and even river mouths.
<i>Trichechus manatus</i>	West Indian manatee	E	Manatees inhabit both salt and fresh water of sufficient depth (1.5 meters to usually less than 6 meters) throughout their range.
<i>Alligator mississippiensis</i>	American alligator	T(S/A)	Rivers, swamps, estuaries, lakes, and marshes.
<i>Charadrius melodus</i>	Piping plover	T	Open, sandy beaches close to the primary dune of the barrier islands and coastlines of the Atlantic for breeding. They prefer sparsely vegetated open sand, gravel, or cobble for a nest site. They forage along the rack line where the tide washes up onto the beach.
<i>Aimophila aestivalis</i>	Bachman's sparrow	FSC	Occurs only in pine forests of the southeastern United States.
<i>Haliaeetus leucocephalus</i>	American bald eagle	T	A single bald eagle's nest is found on MCIEAST-MCB CAMLEJ - at the junction of Sneads Creek and the New River near the back gate. Three protective buffers have been established at approximately 750 feet, 1,000 feet, and 1,500 feet from the nest site.
<i>Laterallus jamaicensis</i>	Black rail	FSC	Marsh and wetlands; The "Eastern" black rail can be found in appropriate saltmarsh habitat along the eastern seaboard from Connecticut to Florida and along the Gulf Coast.
<i>Acipenser brevirostrum</i>	Shortnose sturgeon	E	Sturgeon inhabit the lower sections of larger rivers and coastal waters along the Atlantic coast. They may spend most of the year in brackish or salt water and move into fresh water only to spawn. The fish feeds on invertebrates (shrimp, worms, and so forth) and stems and leaves of macrophytes.
<i>Rana capito capito</i>	Carolina crawfish frog	FSC	Carolina crawfish frogs live primarily in the sandhills and pine barrens of the North Carolina Coastal Plain. Crawfish frogs are more terrestrial than most frogs, generally only coming to the water to breed. They are also nocturnal, spending daylight hours underground in burrows.

TABLE 7-1

**Species Potentially Occurring on or Adjacent to MCIEAST-MCB CAMLEJ, in Onslow County, Listed as Threatened, Endangered, or of Special Concern by USFWS**
*Site-Specific Work Plan*
*MCAS New River – Runway Expansion Area*
*MCIEAST-MCB CAMLEJ, North Carolina*

Scientific Name	Common Name	Federal Status	Habitat
<i>Passerina ciris ciris</i>	Eastern painted bunting	FSC*	Found mainly in southern states and Mexico, where the brushy, weedy shrub-scrub habitat that this bird prefers abounds.
<i>Ammodramus henslowii</i>	Eastern Henslow's sparrow	FSC	A species of tallgrass prairies, agricultural grasslands, and pine savannas of the eastern United States; the species migrates south to spend the non-breeding season in the native pine savanna habitats of the southeastern United States.
<i>Ophisaurus mimicus</i>	Mimic glass lizard	FSC	This species is found in the southeastern Coastal Plain. They are most common in pine flatwoods and open woodlands.
<i>Picoides borealis</i>	RCW	E	For nesting and roosting habitat, open stands of pine containing trees 60 years old and older are preferred. RCWs need live, older pines in which to excavate their cavities. Longleaf pines ( <i>Pinus palustris</i> ) are most commonly used, but other species of southern pine are also acceptable. Dense stands (stands that are primarily hardwoods, or that have a dense hardwood understory) are avoided. Foraging habitat is provided in pine and pine hardwood stands 30 years old or older with foraging preference for pine trees 10 inches or larger in diameter. In good, moderately stocked pine habitat, sufficient foraging substrate can be provided on 80 to 125 acres.
<i>Heterodon simus</i>	Southern hognose snake	FSC	These snakes are found in sandy fields and woods of the Coastal Plain, particularly in the Sandhills region.
<i>Agrotis buchholzi</i>	Buchholz's dart moth	FSC	Found in forested wetlands, scrub-shrub wetlands, shrubland and chaparral, and coniferous woodlands. This moth is mostly found in recently burned habitats. Populations can persist up to about a decade or rarely two without fire, until litter accumulates sufficiently to cover food plants. In most cases, habitat is probably suboptimal beginning approximately 5 years after a fire.
<i>Atrytonopsis sp.</i>	Skipper	FSC	One species, the dusteds, is fairly rare at the coast but found throughout North Carolina ( <i>A. hianna</i> ). An assumption is made that the genus is generally defined.
<i>Isoetes microvela</i>	Quillwort	FSC	Quillworts are usually restricted to areas of clean water where other plants are absent. Occasionally, quillwort may grow partly or entirely out of the water.
<i>Rhexia aristosa</i>	Awned meadowbeauty	FSC	Found in a variety of wet habitats in the Coastal Plain from New Jersey to Alabama.
<i>Lobelia boykinii</i>	Boykin's lobelia	FSC	Grows in swamps and cypress ponds from the coastal plain of Delaware to Florida. The lower portion is often immersed in water, at least seasonally.
<i>Parnassia caroliniana</i>	Carolina grass-of-parnassus	FSC	Bogs, freshwater habitats, grasslands.
<i>Trillium pusillum var. pusillum</i>	Carolina trillium	FSC	Grows in alluvial woods, pocosin borders, and savannas.

TABLE 7-1

**Species Potentially Occurring on or Adjacent to MCIEAST-MCB CAMLEJ, in Onslow County, Listed as Threatened, Endangered, or of Special Concern by USFWS***Site-Specific Work Plan**MCAS New River – Runway Expansion Area**MCIEAST-MCB CAMLEJ, North Carolina*

Scientific Name	Common Name	Federal Status	Habitat
<i>Asplenium heteroresiliens</i>	Carolina (wagner) spleenwort	FSC	Rock outcrops.
<i>Rhynchospora pleiantha</i>	Coastal beaksedge	FSC	Extremely rare; found at fewer than 25 sites throughout its North Carolina-to-Alabama range.
<i>Solidago villosicarpa</i>	Coastal goldenrod	FSC	Known to occur in only five populations in three counties in eastern North Carolina. Three of these populations occur on MCIEAST-MCB CAMLEJ. The other sites are in Pender and Brunswick counties. Currently, the North Carolina Natural Heritage Program is conducting a survey of likely habitat to look for coastal goldenrod.
<i>Thalictrum cooleyi</i>	Cooley's meadowrue	E	Cooley's meadowrue occurs in moist to wet bogs and savannas. It grows along fireplow lines, roadside ditches, woodland clearings, and powerline rights-of-way and needs some type of disturbance to maintain its open habitat.
<i>Carex lutea</i>	Golden sedge	E	Biologists have located golden sedge in only eight locations, all in coastal savannas in Onslow and Pender counties that are underlain by calcareous, or chalk, deposits.
<i>Sagittaria weatherbiana</i>	Grassleaf arrowhead	FSC	Found in shallow water of brackish swamps.
<i>Dichanthelium sp.</i>	Hirst's panic grass	FSC	Worldwide, Hirst's panic grass occurs in four extant populations. Historically, it was found in coastal plain habitats in New Jersey, Delaware, North Carolina, and Georgia. Currently, Hirst's panic grass is known to exist in one site in Delaware and two known sites in North Carolina, both of which are on MCIEAST-MCB CAMLEJ.
<i>Myriophyllum laxum</i>	Loose watermilfoil	FSC	Riparian habitats.
<i>Calopogon multiflorus</i>	Many-flower grass-pink	FSC	Grasslands, pinelands; typically in wet areas.
<i>Plantago sparsiflora</i>	Pineland plantain	FSC	Savannas, roadsides, and ditches.
<i>Lindera melissifolia</i>	Pondberry	E	Associated with wetland habitats such as bottomland and hardwoods in the interior areas, and the margins of sinks, ponds and other depressions in the more coastal sites. The plants generally grow in shaded areas but may also be found in full sun.
<i>Litsea aestivalis</i>	Pondspice	FSC	Freshwater habitats.
<i>Lysimachia asperulaefolia</i>	Rough-leaved loosestrife	E	Species generally occurs in the ecotones or edges between longleaf pine uplands and pond pine pocosins (areas of dense shrub and vine growth usually on a wet, peaty, poorly drained soil), on moist to seasonally saturated sands, and on shallow organic soils overlaying sand. Rough-leaved loosestrife has also been found on deep peat in the low shrub community of large Carolina bays.
<i>Amaranthus pumilus</i>	Seabeach amaranth	T	Occurs on barrier island beaches.
<i>Allium sp.</i>	Savanna onion	FSC	Wet savannas.

TABLE 7-1

**Species Potentially Occurring on or Adjacent to MCIEAST-MCB CAMLEJ, in Onslow County, Listed as Threatened, Endangered, or of Special Concern by USFWS**

*Site-Specific Work Plan*

*MCAS New River – Runway Expansion Area*

*MCIEAST-MCB CAMLEJ, North Carolina*

Scientific Name	Common Name	Federal Status	Habitat
<i>Scleria sp.</i>	Smooth-seeded hairy nutrush	FSC	Dry woods, pineland, and savannas ( <i>S. triglomerata</i> ).
<i>Rhynchospora decurrens</i>	Swamp forest beakrush	FSC	Swamp forests, very rare.
<i>Solidago verna</i>	Spring-flowering goldenrod	FSC	The only spring-flowering goldenrod that occurs in the Sandhills and Coastal Plain of the Carolinas. It can be found in a wide array of habitats, including pine savannas, pocosins, and pine barrens.
<i>Rhynchospora thornei</i>	Thorne's beaksedge	FSC	Bogs, freshwater habitats, pinelands.
<i>Dionea muscipula</i>	Venus flytrap	FSC	Bogs, pinelands.

E = Endangered—A taxon in danger of extinction throughout all or a significant portion of its range.

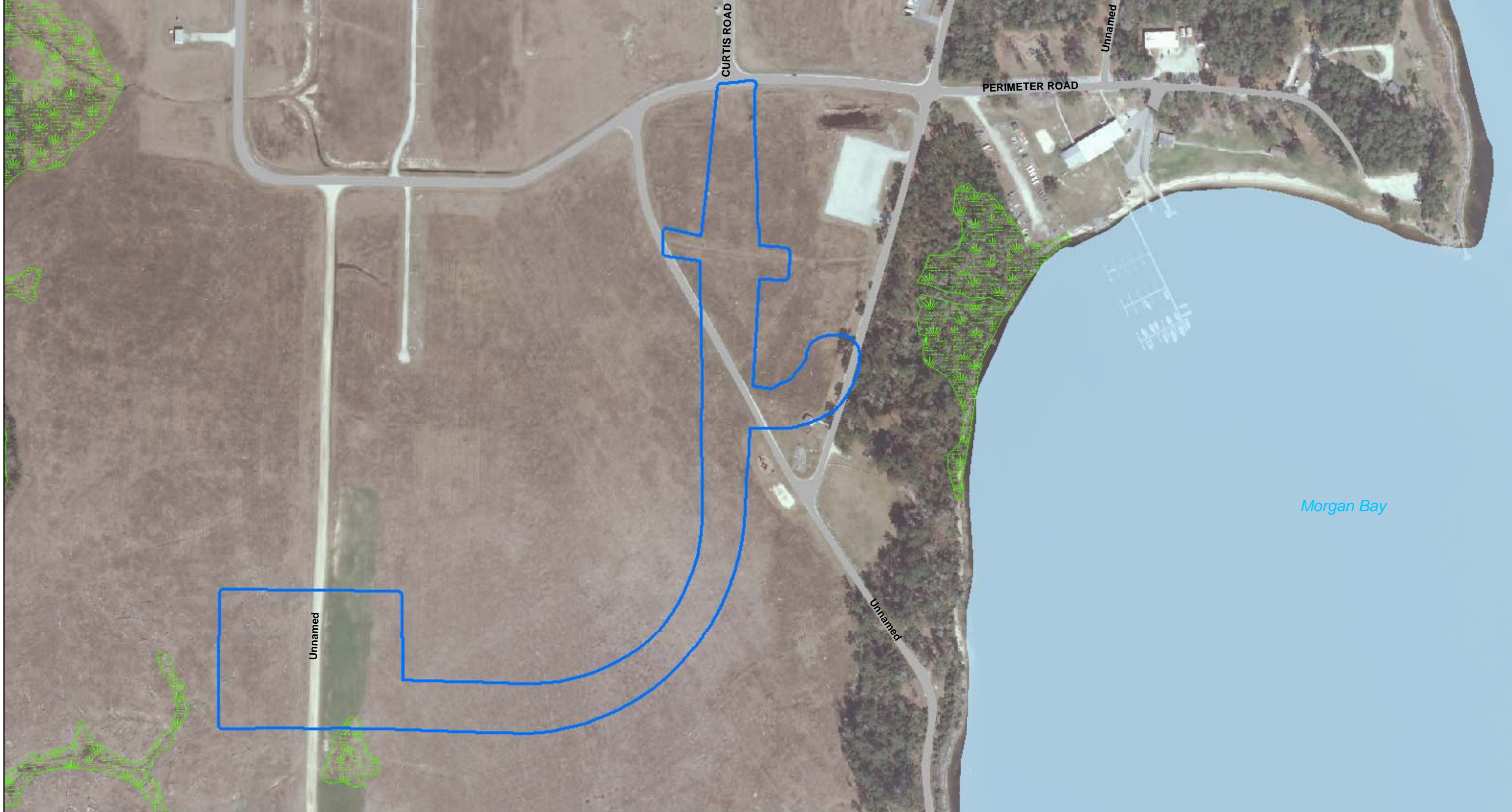
T = Threatened—A taxon likely to become endangered within the foreseeable future throughout all or a significant portion of its range.

FSC = Federal species of special concern—species may or may not be listed in the future.

T(S/A)—Threatened due to similarity of appearance (such as the American alligator)—a species that is threatened due to similarity of appearance with other rare species and is listed for its protection. These species are not biologically endangered or threatened and are not subject to Section 7 consultation.

\*Historical record—the species was last observed in the county more than 50 years ago.





- Legend**
- MRA Boundary
  - Jurisdictional Wetland
  - Surface Water

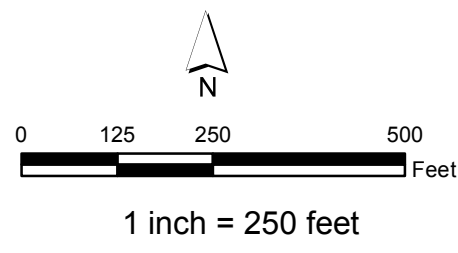


Figure 7-1  
Wetlands Location  
Work Plan Addendum for MCAS New River-Runway Expansion Area  
MCIEAST-MCB CAMLEJ  
North Carolina

## SECTION 8

# References

---

Battelle. 2011. Visual Sample Plan software, Version 6.1. Available at: <http://vsp.pnnl.gov/>

CH2M HILL. 2008. *MCB CamLej Munitions Response Program Master Project Plans, Marine Corps Base Camp Lejeune, North Carolina*. May.

CH2M HILL. 2013. *Investigation and Remediation Waste Management Plan, Marine Corps Base Camp Lejeune, North Carolina*. July.

Marine Corps Installations East-Marine Corps Base Camp Lejeune (MCIEAST-MCB CAMLEJ). 2013. *ESS Determination Request for Running Path and Airfield Clear Zones Non-Intrusive Maintenance, MCAS, New River*.

Naval Ordnance Safety and Security Activity (NOSSA). 2011. *Instruction 8020.15C Explosives Safety Review, Oversight, and Verification of Munitions Responses*. 10 February.

Naval Sea Systems Command (NAVSEA). 2011. OP-5, Volume 1, 7th Revision.

Pennington, Judith C. et al. 2008. *Explosive Residues from Blow-in-Place Detonations of Artillery Munitions. Soil & Sediment Contamination 17:163-180*. 01 March 2008

Thiboutot, Ampleman, and Hewitt. 2002. Technical Report ERDC/CRREL TR-02-1, Guide for Characterization of Sites Contaminated with Energetic Materials.

United States Army Corps of Engineers (USACE). 2001a. *Final Range Identification and Preliminary Range Assessment, Marine Corps Base Camp Lejeune, Onslow, North Carolina. St. Louis District*. December.

USACE. 2001b. *Archives Search Report, Marine Corps Base Camp Lejeune, Onslow County, North Carolina. St. Louis District*. December.

United States Marine Corps (USMC). 2006. *Integrated Natural Resource Management Plan 2007-2011, Marine Corps Base Camp Lejeune, Onslow County, North Carolina*. November.



## Appendix A

# Geophysical Investigation Plan

---

Final

**Geophysical Investigation Plan  
Marine Corps Air Station New River-Runway Expansion Area**

**Marine Corps Air Station New River  
Marine Corps Installations East - Marine Corps Base Camp Lejeune  
North Carolina**

**Contract Task Order WE5A**

**December 2013**

Prepared for

**Department of the Navy  
Naval Facilities Engineering Command  
Mid-Atlantic**

Under the

**NAVFAC CLEAN Program  
Contract N62470-08-D-8012**

Prepared by



**CH2MHILL**

**5701 Cleveland Street, Suite 200  
Virginia Beach, Virginia 23462**

# Contents

---

1.	Purpose and Objective .....	1
2.	Safety Issues .....	1
3.	Geophysical Personnel .....	1
4.	Site Description.....	2
5.	Anticipated MEC Types and Quantities .....	3
6.	Vegetation and Topography .....	4
7.	Geologic Conditions .....	4
8.	Shallow Groundwater Conditions .....	4
9.	Adverse Geophysical Conditions .....	4
10.	Site Utilities .....	4
11.	Man-made Features Potentially Affecting DGM Operations.....	5
12.	Overall Site Accessibility and Impediments .....	5
13.	Potential Worker Hazards.....	5
14.	Analog Geophysical Instruments.....	5
15.	DGM Instrumentation and Positioning Method.....	5
16.	Geophysical System Verification .....	6
17.	DGM Measurement Quality Objectives.....	6
18.	DGM Field Data Sheets.....	9
19.	DGM Data Processing .....	9
20.	DGM Interpretation and Anomaly Selection.....	9
21.	DGM Anomaly Locations .....	10
22.	DGM Anomaly Maps .....	10
23.	DGM Records Management.....	11
24.	Final DGM Reports, Maps and Geophysical Data .....	11
25.	DGM Quality Control.....	14
26.	DGM QC Seed Items .....	15
27.	QC of DGM Data and Deliverables .....	15
28.	DGM Corrective Measures.....	16
29.	Analog Geophysical Instruments QC .....	16
30.	References.....	17

## **Tables**

- 1 DGM Measurement Quality Objectives
- 2 Processing Documentation Requirements for DGM
- 3 Geophysical Instrument Standardization Tests and Acceptance Criteria for DGM

## **Figures**

- 1 MCAS New-River-Runway Expansion Area DGM Investigation Area
- 2 Historic B-17 Range Fan at MCAS New-River-Runway Expansion Area
- 3 Example MRSIMS Anomaly List for EM61-MK2 DGM Data
- 4 FTP Site Directory Structure
- 5 Example Spike Test Setup
- 6 Quality Control of DGM Data – Process Flow Path

## **Attachments**

- 1 Geophysical System Verification Plan

# Acronyms and Abbreviations

---

AHA	Activity Hazard Analysis
ASCII	American Standard Code for Information Interchange
CTO	Contract Task Order
DGM	Digital Geophysical Mapping
FOB	Foreign Object Debris
FTP	File Transfer Protocol
GDB	Geosoft Database
GIP	Geophysical Investigation Plan
GPS	Global Positioning System
GSV	Geophysical System Verification
ISO	Industry Standard Object
IVS	Instrument Verification Strip
MCAS	Marine Corps Air Station
MCIEAST-MCB CAMLEJ	Marine Corps Base Camp Lejeune
MEC	Munitions and Explosives of Concern
MILCON	Military Construction
MPPEH	Material Potentially Presenting an Explosive Hazard
MQO	Measurement Quality Objective
MRP	Munitions Response Program
MRSIMS	Munitions Response Site Information Management System
mV	MilliVolt
NAD83	North American Datum 1983
NAVFAC	Naval Facilities Engineering Command
NRL	Naval Research Laboratory
nT	nano Tesla
PDF	Portable Document Format
PLS	Professional Land Surveyor
QC	Quality Control
SSHP	Site-Specific Health and Safety Plan
UTM	Universal Transverse Mercator
UXO	Unexploded Ordnance

# Geophysical Investigation Plan

---

This Geophysical Investigation Plan (GIP) presents the objectives, approach, operational procedures and quality control (QC) methods to be used to perform digital geophysical mapping (DGM) at the Marine Corps Air Station (MCAS) New River, located at Marine Corps Installations East – Marine Corps Base Camp Lejeune (MCIEAST-MCB CAMLEJ) in Jacksonville, North Carolina.

This GIP is prepared on behalf of the Department of the Navy, Naval Facilities Engineering Command (NAVFAC) Mid-Atlantic, under Contract Number N62470-11-D-8012, Contract Task Order (CTO) WE5A.

## 1. Purpose and Objective

DGM will be conducted in support of proposed MILCON activities including enhancements to MCAS New River hangars, roadways, recreational facilities, and an existing fence line associated with expansion of the runways. Maximum clearance depth for proposed MILCON at MCAS New River is reportedly 5 feet (1.5 meters) at locations corresponding to proposed fence posts and new utility corridors. For the remainder of the investigation area, the clearance depth will be depth of detection using the proposed geophysical instruments.

The objective of the DGM is to identify geophysical anomalies that may represent potential Munitions and Explosives of Concern (MEC) and Material Potentially Presenting an Explosive Hazard (MPPEH) in the subsurface within the proposed footprint of MILCON activities.

## 2. Safety Issues

Because MEC and MPPEH items may be present in the survey area, DGM survey personnel are prohibited from touching, handling, or moving items that may resemble MEC or MPPEH. Upon encountering such an item, survey personnel will immediately inform on-site Unexploded Ordnance (UXO) personnel. In the event that such an item is discovered, either inside or outside the investigation area, and no UXO personnel are present, DGM personnel will conspicuously mark and secure a perimeter around the item and immediately contact the SUXOS. DGM survey personnel should not remain within 100 feet (33 meters) of any suspected MEC or MPPEH item.

DGM survey personnel will not access areas that have not been previously surface cleared by UXO personnel. Personnel will also be required to adhere to the project Site Safety and Health Plan (SSHP).

## 3. Geophysical Personnel

The roles of the geophysical personnel supporting the investigation at MCAS New River are presented below:

- **Senior Geophysicist**

The Senior Geophysicist provides technical and geophysical staff oversight and is responsible for allocating appropriate resources to the project. The Senior Geophysicist serves as the Geophysicist-of-record for the project, conducting independent technical reviews of results and deliverables.

- **Project Geophysicist**

The Project Geophysicist is responsible for oversight of the DGM operations, including preparation for field work, survey execution, and reporting. The Project Geophysicist serves as the field team leader and is responsible for executing the DGM in accordance with this GIP, the SSHP, and for successful achievement of the measurement quality objectives (MQOs). The Project Geophysicist has experience collecting DGM data using the proposed geophysical and positioning equipment.

- **Site Geophysicists**

The Site Geophysicists are responsible for data collection, daily field QC measures, and geophysical instrument maintenance. Site Geophysicists are also responsible for conducting DGM in accordance with this GIP and the

SSHP. The Site Geophysicists are capable of operating the proposed geophysical and positioning equipment with minimal supervision by the Project Geophysicist.

- **Processing Geophysicist**

The Processing Geophysicist is responsible for processing DGM data, data management throughout the project, anomaly identification and selection, and preparation of data delivery packages in accordance with this GIP.

- **Quality Control Geophysicist**

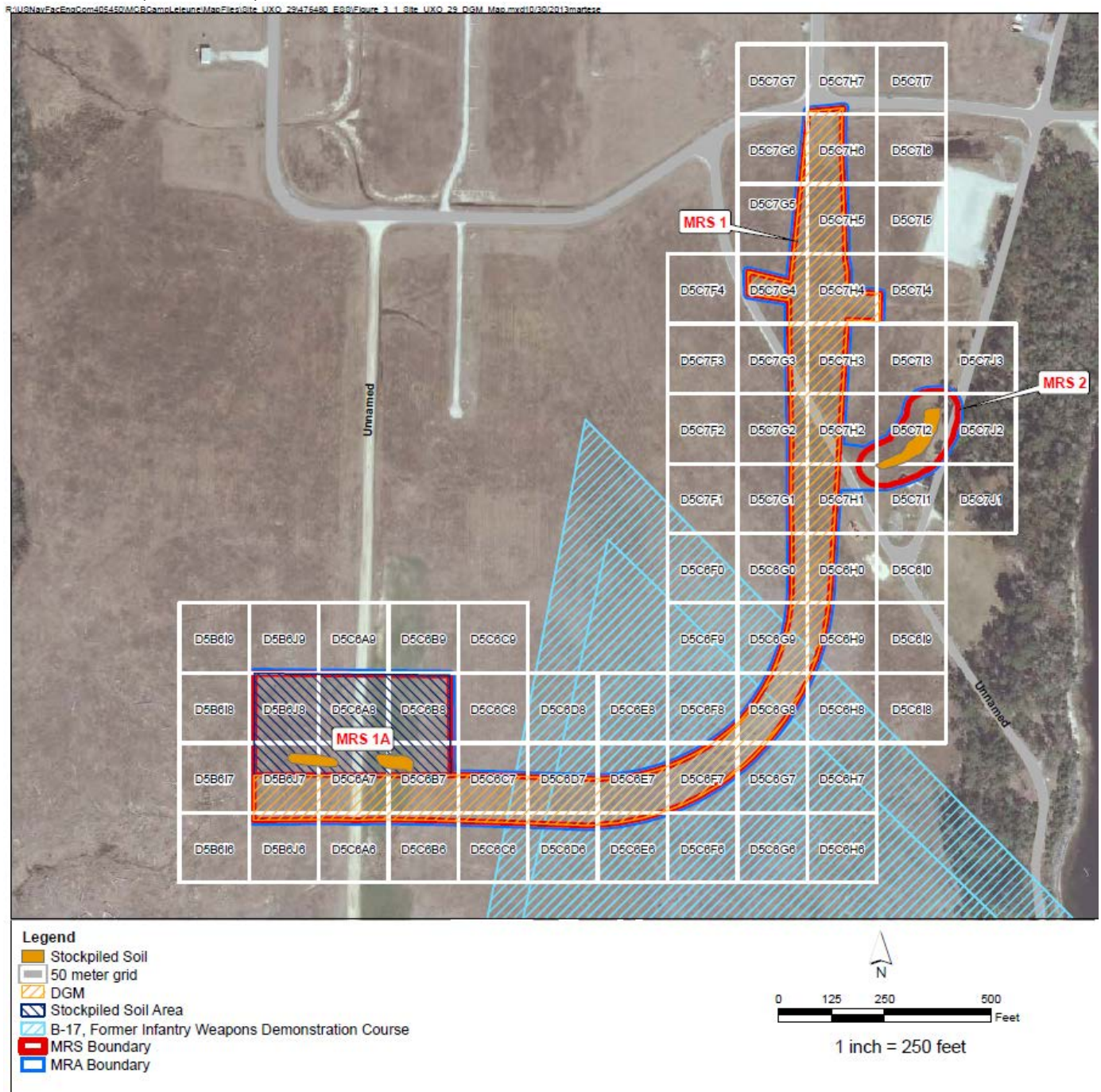
The Quality Control (QC) Geophysicist is responsible for QC of DGM data, project compliance with the GIP, achievement of the MQOs, and delivery of draft and final deliverable packages. The QC Geophysicist is also responsible for conducting an initial review of reports prior to the Senior Geophysicist's review.

## **4. Site Description**

MCAS New River is the primary take-off and landing point for MCIEAST-MCB CAMLEJ. The proposed MILCON footprint encompasses approximately 10.4 acres at MCAS New River, although of this area, approximately 7 acres will undergo DGM. The project area is located south of the existing runways at MCAS New River, and is presented in **Figure 1**.

The proposed MILCON footprint coincides with the boundary for Munitions Response Site (MRS) MCAS New-River-Runway Expansion Area. The project area was designated as an MRS because the northern point of an historic B-17 bombing range fan bisects the project area (**Figure 1**), and practice munitions were identified outside the range fan and within the project area. The site reportedly served as a demonstration range from 1946 to 1947.

FIGURE 1  
**MCAS New-River-Runway Expansion Area DGM Investigation Area**  
 MCAS New River, Jacksonville, North Carolina



## 5. Anticipated MEC Types and Quantities

Available historic information on the former demonstration range indicates that small arms were used, along with the following potential munitions: 37mm, 57mm, 75mm, and 90mm projectiles, 60mm and 81mm mortars, and 2.36-inch and 4.5-inch rockets. Recent construction activity at the site has stopped due to discovery of three 2.36-inch practice rockets. Locations and depths of the practice rockets are not known other than that they were unearthed outside the boundary of the historic range fan.

This list of potential munitions is not considered exhaustive, and additional items may be encountered at MCAS New-River-Runway Expansion Area. Estimated MEC quantities for the former B-17 range are not known.



The smallest potential MEC item of concern for this investigation is the 37mm projectile, based on available historic records on the demonstration range. The extent of its use and the anticipated occurrence within the project investigation area is not known.

## **6. Vegetation and Topography**

The investigation area consists of mowed grass and open areas due to its proximity to existing runways. No vegetation clearance will be performed. As shown in **Figure 1**, asphalt roads bisect the investigation area. Site topography is generally flat.

## **7. Geologic Conditions**

Geologic conditions are generally a concern for DGM when the mineral content of rocks and soils is significant enough to produce anomalies consistent with potential MEC. In particular, these conditions are a greater concern when using magnetometers to conduct surface sweeps or to collect DGM data compared to electromagnetic (EM) or other geophysical instruments.

The regional geology and hydrogeology at MCIEAST-MCB CAMLEJ are discussed in the Munitions Response Program (MRP) Master Project Plans (CH2M HILL, 2008a,b). It is assumed that geologic conditions at the site will not significantly impact proposed DGM because DGM has been successfully completed at various locations within the installation under similar site conditions.

## **8. Shallow Groundwater Conditions**

The regional geology and hydrogeology at MCIEAST-MCB CAMLEJ are discussed in the MRP Master Project Plans (CH2M HILL, 2008a,b).

Localized groundwater conditions may present potential access issues or safety hazards if the survey area is prone to standing water during periods of heavy precipitation. In addition, site-specific groundwater conditions (e.g. depth to water table, salinity) may result in variations of geophysical response signatures of potential MEC items compared to predicted or theoretical responses if the items are susceptible to enhanced corrosion or deterioration due to local groundwater fluctuations and conditions. These areas will be noted during the geophysical investigation, as necessary, and compared to the DGM data in the event that site-specific groundwater conditions impact access or data quality.

## **9. Adverse Geophysical Conditions**

Potential adverse conditions include the presence of metallic foreign objects and debris (FOB) reportedly common within the general proximity of runways. In order to keep runways clear of debris, blower trucks reportedly blow debris into the surrounding fields on a regular basis. Metallic FOB at the surface may result in geophysical anomalies, thereby being selected by the Processing Geophysicist as a target of interest and potentially masking collocated anomalies within the subsurface. No surface clearance for removal of FOB will be performed.

In addition, radar, communications facilities, runway lights, and other associated air field features may adversely impact surveying using electromagnetic (EM) methods due to distortions in the EM fields. Depending on the severity of the impact, the result may be manifested by increased variation within the background responses or potential noise spikes with magnitudes larger than the desired target selection threshold. Potential noise spikes may create false positives in the DGM target selection process if the Processing Geophysicist is not able to make a determination of noise spike versus target of interest from the DGM response characteristics (e.g. amplitude, decay, instrument fall-off).

## **10. Site Utilities**

CH2M HILL will review available underground utility maps from MCIEAST-MCB CAMLEJ to evaluate the presence of potential underground utilities within the proposed DGM area. Because the investigation area is located close to existing runways and because roads bisect the investigation area, the potential for underground utilities is high.

No underground utility mark-outs will be completed prior to conducting DGM. If electronic as-built utility drawings can be obtained by CH2M HILL, the drawings will be utilized during project preparations.

## **11. Man-made Features Potentially Affecting DGM Operations**

Manmade features that would potentially impact the DGM operations include metallic FOB, existing underground utilities, and roadways. The impact to the DGM data would be potential masking of collocated anomalies within the subsurface, selection of anomalies associated with manmade features as targets of interest, or saturated response areas. A saturated response area is a defined area in the DGM data where identification of individual, discrete anomalies is not possible due to a significantly elevated anomaly density.

## **12. Overall Site Accessibility and Impediments**

The DGM areas are located within secure portions of the installation and access to the areas will be coordinated with appropriate safety, UXO, and installation personnel. Otherwise, there are no expected site accessibility impediments.

No substantial delays due to abnormally harsh weather conditions are expected to impact the geophysical operations, although periods of heavy rain or other localized weather patterns during field work may result in temporary inaccessible conditions. CH2M HILL will monitor these conditions in the days prior to the field work start date and will be in regular communication with the subcontractors' field teams. Daily assessments of these conditions will also be made during the site safety briefings.

## **13. Potential Worker Hazards**

Potential hazards include those associated with conducting field work in humid climates, work near roadways, and work near runways (e.g. vehicles, exposure to loud noises, wind, jet fuel fumes).

These and other specific hazards will be addressed in more detail in the project activity hazard analysis (AHA), site safety and health plan (SSHP), and during daily site safety briefings.

## **14. Analog Geophysical Instruments**

The primary analog geophysical instrument to be used during non-DGM operations (e.g. MEC avoidance, placement of QC seeds) will be a White's XLT all-metals detector (or equivalent all-metals detector). The White's XLT all-metals detector is capable of identifying both ferrous and non-ferrous metals and is swept back and forth at a height of a few inches above the ground surface. Audible tones and a digital display on the instrument indicate the presence of subsurface metal.

The Schonstedt GA-52 handheld magnetometer may be used to supplement the White's XLT. The Schonstedt GA-52 consists of two vertically-oriented sensors separated by 20 inches (50 centimeters). The Schonstedt GA-52 is capable of identifying ferrous objects and is swept back and forth at a height of a few inches above the ground surface. Audible tones indicate the presence of subsurface ferrous material.

## **15. DGM Instrumentation and Positioning Method**

DGM will be conducted primarily using the Geonics, Ltd. EM61-MK2. The EM61-MK2 has been presumptively selected based on existing site conditions, potential for non-ferrous munitions components, prior successful use in the detection of 37mm projectiles, and prior successful use in support of MILCON activities elsewhere at MCIEAST-MCB CAMLEJ. DGM with the EM61-MK2 will be performed across 100% of the accessible portions of the approximately 7-acre (3 hectare) MILCON footprint using a single-coil, person-portable EM61-MK2. This coverage is based on an intended lane spacing of 2.5 feet (0.75 meters) across the investigation area.

Additional DGM may be conducted with the Geometrics G-858 dual-sensor magnetometer (i.e. gradiometer) if it is determined that the EM61-MK2 data are adversely impacted by the conditions described in Sections 9 through

11. It is possible that only certain grids (estimated at up to 2 acres) may be impacted by these conditions, and need to be re-mapped using the G-858. If it is determined at the onset of the DGM operations that adverse effects on the EM61-MK2 are significant and widespread, the G-858 may be utilized to conduct the entire investigation. If utilized, the G-858 will record both magnetic total field and magnetic gradient data. A Geometrics G-856 proton precession magnetometer (or an additional G-858) will be used as a magnetic field base station.

Location control for the DGM data (EM61-MK2 and G-858) will be performed using real-time kinematic global positioning systems (RTK GPS). Wooden stakes marking the corners of the base-wide 150-foot by 150-foot (50-meter by 50-meter) grid system will be set by a North Carolina licensed professional land surveyor (PLS) prior to the start of DGM. Stakes will be placed without any metal markers (e.g. rebar, hubs, nails) and will not extend more than 1 foot (0.3 meter) above the ground surface. UXO personnel will conduct MEC avoidance during placement of surveyor stakes.

The EM61 survey at MCAS New-River-Runway Expansion Area will likely be conducted using the instrument's standard wheels. Data will be collected in automatic mode at a rate of 10 readings per second. The G-858 will be hand-carried by DGM personnel with the sensors most oriented in the vertical gradient mode.

## 16. Geophysical System Verification

DGM system validation will be performed for the EM61-MK2 using the Geophysical System Verification (GSV) process. The GSV process is a physics-based, presumptively selected technology process in which signal strength and sensor performance are compared to known response curves of industry standard objects (ISOs) to verify DGM systems prior to and during site surveys. The GSV process is designed to perform initial verification of the proposed DGM system using an IVS followed by a blind seeding program for continued verification throughout the field operations. The GSV Work Plan is provided as **Attachment 1** to this document.

System validation for the G-858 will be performed on a qualitative basis that draws upon elements of the GSV process but will not be conducted as part of the formal GSV process. Variations exist in the earth's geomagnetic field dip angle and strength with geographic location, as well as localized effects of remnant magnetization due to geology adversely impact the ability to utilize the formal GSV process or establish a rigorous, quantitative QC program because these processes are based on comparison of field data to industry standards that are applied irrespective of geographic location. Therefore, CH2M HILL will implement a qualitative QC program for the G-858 system validation that draws upon elements of the formal GSV process. A blind seeding program will also be implemented for the G-858 survey of the site.

## 17. DGM Measurement Quality Objectives

The primary objective of the geophysical surveys at the subject site is to identify geophysical anomalies indicative of potential MEC or MPPEH in the subsurface. MQOs for these surveys are provided in **Table 1**.

TABLE 1  
**MCAS New-River-Runway Expansion Area DGM Measurement Quality Objectives**  
*MCAS New River, Jacksonville, North Carolina*

MQO	Measurement Performance Criteria	Test Method
<b>General System Verification</b>		
<b>DGM System Munitions Detection (EM61-MK2).</b> DGM system response is within industry standards for detection.	Response to ISO will consistently not vary more than $\pm 20\%$ from predicted response for specific distance from sensors in static test.	Results of QC Test #5 in <b>Table 3</b> will be compared to predicted EM61 response curves for ISOs at different distances from the sensor and orientation.
<b>DGM System Munitions Detection (G-858).</b> DGM system responds consistently to ISO.	Response is comparable during each QC test for an ISO placed at a fixed location and distance (at least 16 inches [40 centimeters]) from the bottom sensor (in vertical gradient mode).	Results of QC Tests #5 ( <b>Table 3</b> ) will be qualitatively evaluated for the presence of significant variations or spikes in both background and response data from ISO.

TABLE 1

**MCAS New-River-Runway Expansion Area DGM Measurement Quality Objectives***MCAS New River, Jacksonville, North Carolina*

MQO	Measurement Performance Criteria	Test Method
<b>DGM System Positioning.</b> Coordinates obtained from DGM system are of sufficient accuracy for relocation of anomalies.	Measurements made as a daily QC check of positioning systems will not exceed 4 inches (10 centimeters) compared to known, surveyed location.	Results of QC Test #4 ( <b>Table 3</b> ) will be quantitatively evaluated for compliance.
<b>Repeatability.</b> Repeatable and accurate data are being obtained from DGM system.	IVS seed item positions will be consistently within $\pm 0.8$ feet ( $\pm 25$ centimeters) of known, surveyed locations. Response amplitudes collected along the IVS seeded and background transects will be comparable from one day to the next.  Approximately 2% of each survey unit (e.g. group of transects or grids) will be re-surveyed, where responses are comparable to original line data.	IVS seeded and background transects will be collected at least 2x daily as described in Section 25. Positions of the IVS seed items will be quantitatively compared to the surveyed locations recorded during emplacement.  IVS response amplitudes and results of repeat line collection in Section 25 will be qualitatively compared to results of original survey data.
<b>DGM Surveys</b>		
<b>Data Density.</b> Down line data density is sufficient to detect MEC items.	Over 98% of possible sensor readings are captured along a survey transect with a spacing of no greater than 0.7 foot (0.213 meter) between points. A data gap greater than 2 feet (0.61 meter) will not meet the MQO, unless the gap is associated with an obstruction or hazard.	Results of DGM surveys will be quantitatively evaluated for compliance.
<b>DGM Survey Coverage (Lane Spacing).</b> Lane spacing intended to provide 100% coverage of accessible portions of the DGM investigation area.	Lane spacing is no greater than 3.3 feet (1 meter) with an intended lane spacing of 2.5 feet (0.75 meter).	Footprint coverage of DGM surveys will be evaluated for missing or improperly positioned survey lines as well as data gaps that are not otherwise explained.
<b>Data Positioning.</b> Positioning of detected anomalies is accurate.	Anomaly locations representing QC seeds occur within a 3.3-foot (1-meter) radius of a point on the ground surface directly above the QC seed.	Anomalies selected will be compared with surveyed seed item locations for compliance.
<b>Data Handling</b>		
Data must be delivered in a timely manner and in accordance with GIP requirements (Section 24).	Data packages are completed and delivered within schedule (3 days pre-processed; 5 days processed).	Evaluated based on actual delivery of data.

**DGM System Positioning**

The MQO for DGM systems positioning is that the coordinates being obtained from the RTK GPS are at a sufficient accuracy to allow for appropriate relocation of MEC or MPPEH for intrusive investigation. The measurement performance criterion for this is that the positional error of the system at known, surveyed locations will not exceed 4 inches (10 centimeters). This will be evaluated by ensuring that, on a daily basis, the positioning system being used passes QC Test #4 in **Table 3**.

**System Munitions Detection**

The MQO for munitions detection is to demonstrate that the EM61-MK2 system is capable of detecting munitions items within industry standards. This capability is demonstrated through a process in which signal strength and sensor performance are compared to validated industry values. For the EM61-MK2, this process involves demonstrating that the amplitude response from an ISO falls within 20% of the predicted, published sensor

response for that item (NRL, 2009). Once it has been demonstrated that the system responds comparably, a cross correlation of industry experience with detection of munitions items can be assumed. In other words, the depths and orientations of munitions items which the EM61-MK2 has been shown to be effective under test scenarios and other projects can be expected (NRL, 2008).

The spike test results (QC Test #5, **Table 3**) will determine whether the geophysical instrument is responding to within a specific threshold. In this test, the distance from the coil and orientation of the ISO can be strictly controlled in the field.

This MQO will apply to the EM61-MK2. For the G-858, this process will involve a qualitative evaluation of the background sensor response and the responses from an ISO. Similar to the EM61-MK2 QC test, an ISO will be placed in a fixed location at a constant distance of at least 40 centimeters from the sensor. The responses from the ISO will be qualitatively evaluated for data spikes, drop outs (i.e. “zero” readings due to bad sensor orientation with respect to earth’s magnetic field), and significant variations or base line shifts between individual tests.

### ***Repeatability***

The MQO for DGM systems data repeatability is that the systems respond consistently from the beginning to the end of daily operation. This process involves demonstrating twice daily that the maximum amplitude response from ISOs buried in the IVS are generally consistent from the start of the day through the end of the day and from the start of the operation through the end for both EM61-MK2 and G-858.

In addition, as part of this MQO, repeat data profiles will also be collected and qualitatively compared to the original line data. The repeatability evaluations are qualitative evaluations due to potentially slight variations in path traveled along the IVS and during survey line data and repeat line collection.

Repeatability of the DGM data will be evaluated by ensuring that, on a daily basis, the geophysical system being used passes QC Tests #6 in **Table 3**.

### ***DGM Data Density***

The MQO for down line (along the survey lane) data density is to have sufficient data collected along each transect to detect MEC items and to minimize potential data gaps. The measurement performance criteria are that at 98% or more of possible sensor readings are captured along each transect at distances of 0.7 foot (0.213 meter) or less and that no individual data gaps greater than 2 foot (0.61 meter) exist along a survey transect, unless the gap is associated with a surface obstruction. This spacing will be quantitatively evaluated in order to determine whether the DGM survey data used for anomaly selection meet this requirement.

### ***DGM Survey Coverage (Lane Spacing)***

The MQO for lane spacing refers to the ability to maintain appropriate spacing between individual survey lanes for achieving 100% coverage of accessible portions of the survey area. The measurement performance criterion for this is that the lane spacing is no greater than 3.3 feet (1 meter), with an intended lane spacing of 2.5 feet (0.75 meter). The specified lane spacing is intended to provide sufficient overlap of the sensor footprint in order to effectively achieve 100% coverage. Survey data will be evaluated for missing lines, improperly positioned lines and data gaps that are not otherwise explained (e.g. surface obstruction) in order to determine whether the DGM survey footprint has adequately achieved 100% coverage.

### ***Data Positioning***

The MQO for data positioning accuracy is that positioning of detected anomalies is accurate enough to allow for effective reacquisition of the anomaly. The measurement performance criterion for this is that 100% of anomaly locations representing QC seeds are within a 3.3 feet (1 meter) radius of a point on the ground surface directly above the source of the anomaly associated with the seed item. An anomaly that is selected outside this radius will not be considered to be a successful detection of that item, unless the reasons for this occurrence can otherwise be explained.

## ***Data Handling***

The MQO for data handling is that pre-processed and final processed data must be delivered in a timely manner and in a useable format. During production surveys, the measurement performance criterion for data handling will require that “draft” (raw) data packages be completed and delivered within 3 working days of data collection and the final data packages within 5 working days of data collection. Compliance will be evaluated based on the actual delivery of data.

## **18. DGM Field Data Sheets**

Field information will be logged and recorded in the Munitions Response Site Information Management System (MRSIMS). Field devices will be set up for use with MRSIMS and will include the following data entry fields:

- Site ID
- Survey Area ID (e.g. grid, grid block, etc.)
- Field team leader name
- Field team members’ names
- Date of data collection
- Geophysical instrument used
- Positioning method used
- Instrument serial numbers
- Geophysical data file names
- Data collection rate
- Line numbers
- Weather conditions
- Terrain conditions
- Cultural conditions
- Associated QC data file names
- Miscellaneous field notes

## **19. DGM Data Processing**

Instrument-specific software will be used for initial data processing, and the output will be imported into Geosoft Oasis Montaj™ (Geosoft) for additional processing, graphical display, anomaly selection and QC evaluation. Types of processing will be system specific, but the general processing steps include, but may not be limited to, the following:

- Positional offset correction
- Sensor bias, background leveling and/or standardization adjustment
- Sensor drift removal
- Latency or lag correction
- Geophysical noise identification and removal (spatial, temporal, motional, terrain induced)
- Contour level selection with background shading
- Digital filtering and enhancement (low pass, high pass, band pass, convolution, correlation, non-linear, etc.)

## **20. DGM Interpretation and Anomaly Selection**

The Processing Geophysicist will use the following criteria, supplemented by site- and system-specific criteria established during instrument validation, for selecting geophysical anomalies that appear to be indicative of potential MEC or MPPEH:

- Maximum amplitude of the response with respect to local background conditions and smallest munitions item of interest
- Decay curve characteristics (EM61-MK2)

- Dipole characteristics (G-858)
- Location of the response with respect to inaccessible areas, land features, cultural features, or utilities that bisect the transects
- Potential distortions in the response due to interference from manmade features that may be identified at the site during the DGM survey

The anomaly selection criteria will be reviewed and approved by the QC Geophysicist during data analysis.

## 21. DGM Anomaly Locations

The data analysis process culminates in the creation of anomaly lists in MRSIMS format, an example of which is shown as **Figure 3**. These lists can be opened using Microsoft Excel or standard text editors and include, at a minimum, the following information:

- Unique anomaly identifiers
- Survey area identifier
- Predicted location in Universal Transverse Mercator (UTM), North American Datum 1983 (NAD83) coordinates, in Easting (meters) and Northing (meters)
- Coordinates in site-specific UTM zone
- Anomaly type identifier (e.g. cultural debris, suspected utility, saturated response area, etc.)
- Response amplitude
- Unit of response (e.g. millivolt [mV]) or nanoTeslas [nT])

FIGURE 3

**Example MRSIMS Anomaly List for EM61-MK2 DGM Data**

*MCAS New River, Jacksonville, North Carolina*

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	ID	GRIDCELLID	X1	Y1	X2	Y2	X3	Y3	X4	Y4	TYPE	AMPLITUDE	UNITS	s_ColLineage	s_Generation	s_GUID	s_Lineage
2	1	K2F9J1WB	258959.4	2006299.6	0	0	0	0	0	0	1	3.67	mV				
3	2	K2F9J1WB	258962.4	2006302.2	0	0	0	0	0	0	1	19.42	mV				
4	3	K2F9J1WB	258964.2	2006301.8	0	0	0	0	0	0	1	4.47	mV				

## 22. DGM Anomaly Maps

DGM deliverables will include anomaly maps that contain, at a minimum, the following information:

- Client name
- Project name
- DGM Subcontractor
- Map creator
- Map approver
- Date of map creation
- Map file name (full path and file extension)
- Map scale
- Survey area identification
- Contoured data with color scale
- Anomaly locations with unique identification numbers that match anomaly lists
- North arrow, legend, title block, etc.

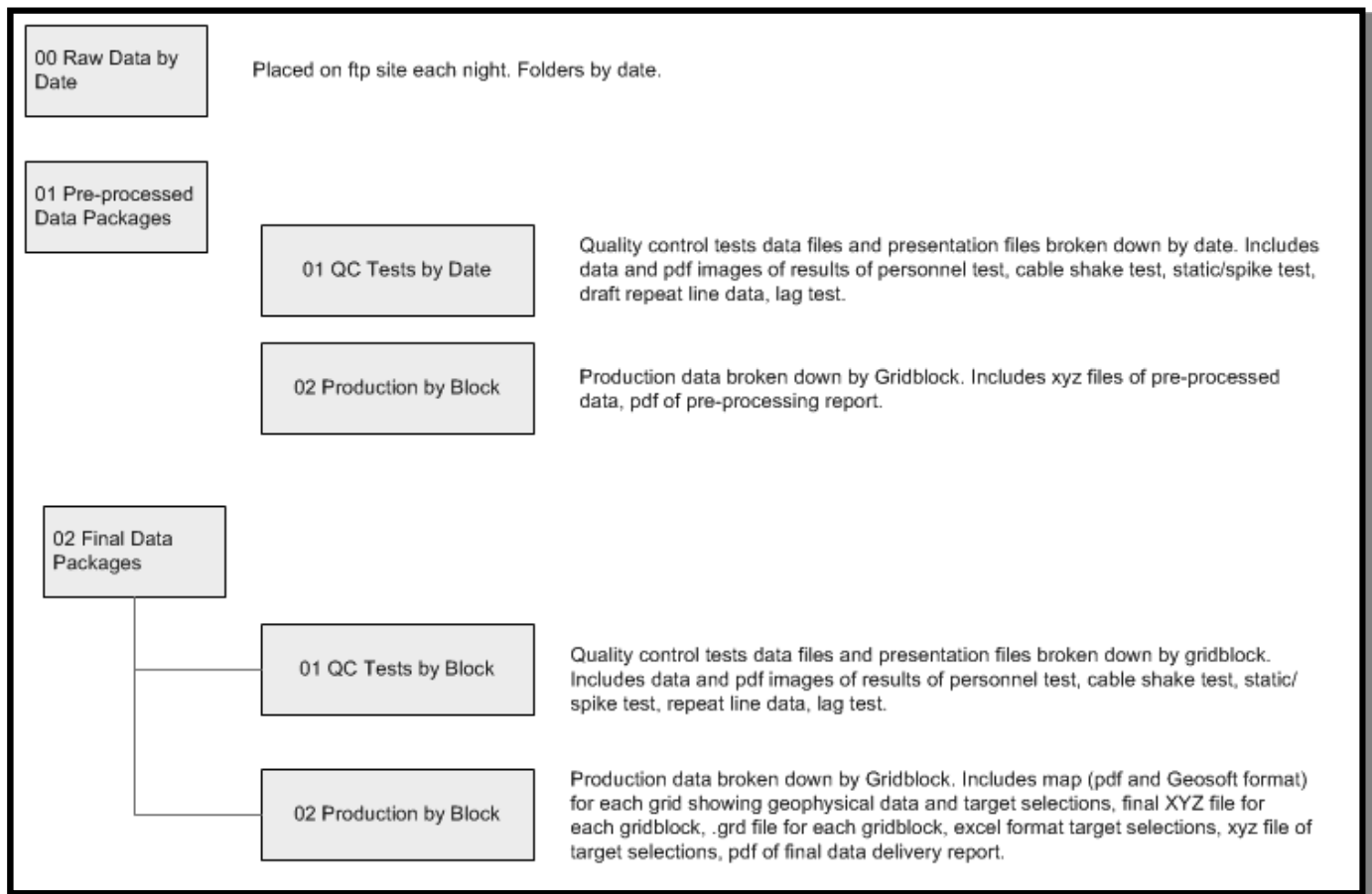
## 23. DGM Records Management

Data files and deliverables will be available for review throughout the project in order to verify that field and data processing procedures are implemented according to this GIP. Raw data files, final processed data files, hard copies, and field notes will be maintained for the duration of the project.

## 24. Final DGM Reports, Maps and Geophysical Data

Geophysical data will be provided via a Secure File Transfer Protocol (FTP) or project-specific Share Point site maintained by CH2M HILL. Data will also be provided on DVD or CD with the final report. **Figure 4** presents the folder structure that will be used on the FTP site.

FIGURE 4  
FTP Site Directory Structure  
MCAS New River, Jacksonville, North Carolina



The deliverable requirements and data delivery schedule include the following:

- Raw data will be provided on a daily basis. Raw data are defined as data files stored on the instrument data logger, without any modification (or filtering) that changes the originally recorded values from the geophysical sensor and positional instrument (if applicable).
  - *File Format* - Raw data will be provided as American Standard Code for Information Interchange (ASCII) text format so the data files are viewable in text editing software. Proprietary binary format data will be directly converted to text format before delivery.
  - *Naming Convention* - Each delivered raw file will have an informative and unique name. Daily production raw files will have the acquisition date as part of the file name.



- Pre-processed data will be provided within 3 working days of data collection. The following applies to pre-processed data deliverables:
  - Pre-processed geophysical data, including QC tests, will be delivered in Geosoft database (GDB) and xyz format, readable by Geosoft.
  - QC test databases and Adobe Acrobat Portable Document Format (PDF) files containing images of QC test results will be provided and organized by date.
  - Pre-processed production data will be provided by designated survey area (e.g. grid, grid block, etc.)
  - An MRSIMS Pre-Processed Data Delivery Report in PDF format will be provided with each designated survey area, which will contain field notes and pre-processing information. Information provided by the MRSIMS report is summarized in **Table 2**.
  - Pre-processed production data will be delivered in GDB or xyz format, and will include the following minimum channel information:
    - Easting (X) and Northing (Y) coordinates in site-specific UTM projection and in units of meters
    - Time (with precision to at least 0.1 second)
    - Raw geophysical data channels
    - Pre-processed geophysical data channels
- Final processed data will be provided within 5 days of data collection. The following applies to the final processed data deliverables.
  - Processed geophysical data, including QC tests will be delivered in GDB or xyz format.
  - QC test databases and PDF files containing images of QC test results will be provided by survey area.
  - Processed production data will be provided by survey area.
  - An MRSIMS Final Data Delivery Report will be provided with each designated survey area, which will contain field notes and final processing information. Information provided by the MRSIMS report is summarized in **Table 2**.
  - Processed production databases will include the following minimum channel information:
    - Easting (X) and Northing (Y) coordinates in site-specific UTM projection (NAD 83) and in units of meters
    - Time (with precision to at least 0.1 second)
    - Raw geophysical data channels
    - Pre-Processed geophysical data channels
    - Processed geophysical data channels
  - Final deliverables will include:
    - Geosoft “.map” file for each grid
    - PDF of Geosoft map for each grid
    - Geosoft grid “.grd” file for survey area, showing gridded data from the channel used for anomaly selection
    - Microsoft Excel (i.e. MRSIMS format) and Geosoft “.xyz” target files for each grid (or a text file stating “there were no selected targets in Grid X”, if applicable)

Final processed filenames will include the grid or survey area name.

The processed geophysical field data, final maps and supporting geophysical interpretations will be provided within 10 days of completion of the field work.

TABLE 2  
**Processing Documentation Requirements for DGM**  
*MCAS New River, Jacksonville, North Carolina*

Information Type	Raw Data Delivery Report	Final Data Delivery Report	In File Headers
Site ID	X	X	X
Geophysical instrument used	X	X	X
Positioning method used	X	X	X
Instrument serial numbers (geophysical and positioning)	X	X	
Coordinate system and unit of measure	X	X	X
Grid ID (or other identifier of surveyed area)	X	X	X
Date of data collection	X	X	X
Raw data file names associated with delivery	X	X	
Processed data file names associated with delivery	X	X	
Name of Project Geophysicist	X	X	
Name of Site Geophysicist	X	X	
Name of data processor	X	X	
Data processing software used with version number	X	X	
Despiking method and details	X	X	
Sensor drift removal and details	X	X	
Latency/lag correction and details	X	X	
Sensor bias, background leveling and/or standardization adjustment method and details		X	
PDF document showing graphical results of each field quality control test	X	X	
Geophysical noise identification and removal (spatial, temporal, motional, terrain induced) and details		X	
Other filtering/processing performed and details		X	
Gridding method		X	
Anomaly selection and decision criteria details		X	
Geosoft “.gdb” file for unit of survey being delivered (e.g. grid, grid block, or other area agreed upon with the client)		X	
Geosoft “.xyz” file for unit of survey being delivered (e.g. grid, grid block, or other area agreed upon with the client)		X	
Geosoft “.grd” file for unit of survey being delivered		X	
Geosoft “.map” file for unit of survey being delivered		X	
PDF of Geosoft map for unit of survey being delivered		X	
Other processing comments		X	
Date data processing is completed	X	X	
Data delivery date	X	X	
Scanned copy of field notes and field mobile data collection device notes (if applicable)	X		

## 25. DGM Quality Control

The geophysical instruments will be field tested as part of the daily functional checks and as a means of reviewing system performance for compliance with the MQOs. A description of each test, its acceptance criteria and frequency is provided below and summarized in **Table 3**.

- **Equipment Warm-up (Test #1).** The EM61-MK2 will be turned on for a minimum of 10 minutes prior to use. Equipment warm-up is performed each time the instrument is first turned on for the day or has been off for an extended period of time, thereby allowing the instrument to “cool down.”
- **Personnel Test (Test #2).** This test checks the response of instruments to the personnel and their clothing/proximity to the system. On a daily basis, instrument sensors are checked for their response to the personnel operating the system, with response observed in the field for immediate corrective action. The personnel test is conducted at the beginning of the survey operations for each work day.
- **Vibration Test (Cable Shake) (Test #3).** This test checks the response of instruments to vibration. On a daily basis, instrument sensors are checked for their response to vibrations through shaking the cables and observing the response in the field for immediate corrective action. The vibration test is conducted at the beginning of the survey operations for each work day.
- **Record Sensor Positions (Test #4).** Positioning accuracy of the final processed data will be demonstrated by operating the RTK GPS equipment over one or more known points. The accuracy of the data positioning will be assessed by calculating the difference between a known location over which a positioning instrument is held and the displayed position. The sensor position test will be conducted at the beginning of the survey operation for each work day. This test will not apply to DGM data collected using fiducial positioning methods.
- **Static Background and Static Spike (Test #5).** Static tests are performed by keeping the survey equipment stationary and positioning them within, or close to, the survey boundaries in an area relatively free of sources of metallic interference. Data are initially collected for a specific period (typically 1 minute) in order to measure background conditions. While keeping the instrument in a fixed position, data are recorded with a “spike” (e.g. ISO) placed at an accurately measured distance and orientation from the sensor. The purpose of the static test is to determine whether unusual levels of instrument or ambient noise exist. The static background and static spike test are conducted at the beginning and end of each survey operation as well as in between each designated survey area. For example, if the data are collected as blocks of transects (where one block comprises several transects), the static tests will also be conducted in between each block. Therefore, this test effectively “opens” and “closes” out the designated survey area.

The ISO can be placed above or below the sensor so long as the distance is measured from the ISO center of mass to the center of the sensor. For the EM61-MK2, the center of the sensor corresponds to the center of the horizontal plane of the transmit coil (top of coil if item placed above coil, bottom of coil if item placed below), as illustrated in **Figure 5**.

For the G-858 survey, this test will also include an azimuth test, where the operator turns in a 360-degree pattern with the system in order to assess potential “dead zones” or positions of the sensor relative to the geomagnetic field where response is diminished. These dead zones typically result in data “drop outs,” where data are not actually recorded. These orientations and directions will be noted so that the survey lanes can be oriented in such a way as to optimize signal to noise ratio as well as minimize the potential for data drop-outs.

FIGURE 5  
**Example Spike Test Setup**  
MCAS New River, Jacksonville,  
North Carolina



- **Repeat Data (Test #6):** This test is performed to demonstrate repeatability of the DGM data. The IVS seeded transect and background transect will be collected at least twice daily, where the seed item positions will be detected to within  $\pm 0.8$  feet ( $\pm 25$  centimeters) of their surveyed locations recorded during emplacement. In addition, a qualitative comparison of the response amplitudes from the IVS seed items and the background transect will be performed. Lastly, approximately 2% of each survey unit (i.e. block of transects or grids) will be repeated. Because of the intrinsic difficulty of following the exact same path for collecting dynamic repeat data, this test will be a qualitative comparison.

TABLE 3

**Geophysical Instrument Standardization Tests and Acceptance Criteria for DGM***MCAS New River, Jacksonville, North Carolina*

Test	Test Description	Acceptance Criteria	Power On	Beginning of Day	Beginning and End of Day	Between Survey Areas	~2% of Daily Area Surveyed
1	Equipment Warm-up	Equipment specific (minimum 10 minutes)	X				
2	Personnel Test	Personnel, clothing, etc. should not result in EM61-MK2 target picking channel data spikes >2 mV from the mean		X			
3	Vibration Test (Cable Shake)	Data profile does not exhibit EM61-MK2 target picking channel data spikes >2 mV from the mean		X			
4	Record Sensor Positions (RTK GPS)	Accuracy of positioning data at known, surveyed location is within 4 inches (10 centimeters)		X			
5	Static Background and Static Spike	$\pm 20\%$ of standard item response, after background correction; azimuth test (G-858) results identify potentially unfavorable sensor orientations or, or if an unfavorable orientation is identified, it is noted and not used during production survey.			X	X	
6	Repeat Data	IVS seed item locations within $\pm 0.8$ feet (25 centimeters) of known, surveyed locations;  Qualitative repeatability of response amplitude			X		X

mV = millivolt

## 26. DGM QC Seed Items

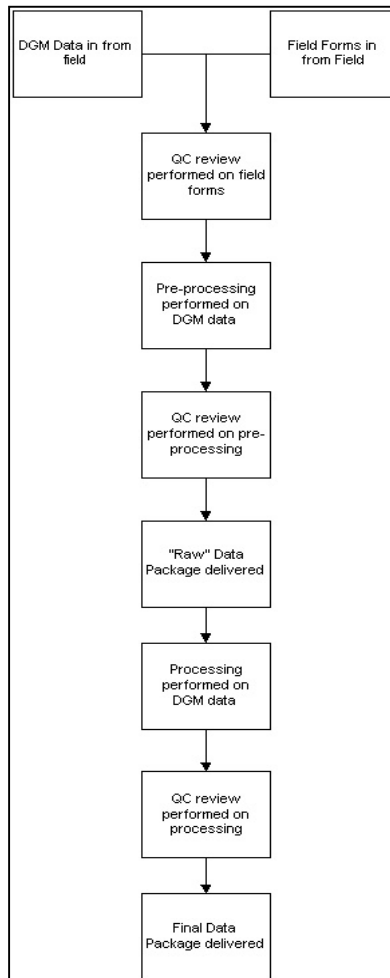
QC seed items, consisting of small ISOs, will be buried approximately every 0.75 acre. Details of the blind seeding program are provided in the GSV Work Plan, included as **Attachment 1** to this document.

## 27. QC of DGM Data and Deliverables

CH2M HILL will perform QC of geophysical data and data deliverables at each step of the processing path.

**Figure 6** depicts the processing path and the QC steps performed. Data will not move to the next stage until they have passed each QC check.

**FIGURE 6**  
**Quality Control of DGM Data – Process Flow Path**  
*MCAS New River, Jacksonville, North Carolina*



## 28. DGM Corrective Measures

The following are the basic corrective measures to be followed in association with the DGM conducted as part of this investigation:

- Replacement of sensors if they fail to meet functional check requirements.
- Potential re-collection of survey area units (i.e. grid blocks) if seeded items are not identified (do not appear in the DGM data).
- Potential re-collection of survey area units (i.e. grid blocks) if MQOs are not met.
- Potential re-analysis of the DGM data if there is a failure to select a seed item as a target anomaly, but the item is clearly present in the DGM data.

## 29. Analog Geophysical Instruments QC

QC of the analog geophysical instruments will be accomplished through daily checks that verify the instruments are functioning prior to being used for field activities. Each instrument will be operated within an instrument check area established by on-site UXO personnel and containing buried metallic items (e.g. ISOs). The IVS may serve as the equipment check area, or, if necessary a separate check area would be established by on-site UXO personnel if needed before DGM starts and the IVS is established. If an analog instrument is not able to detect the item, it will be taken out of use until it is repaired.



## 30. References

CH2M HILL, 2008a. *Master Project Plans, Marine Corps Base Camp Lejeune, Jacksonville, North Carolina*. June.

CH2M HILL, 2008b. *MCB CamLej Munitions Response Program Master Project Plans, Marine Corps Base Camp Lejeune, North Carolina*. May.

Naval Research Laboratory, 2009. *EM61-MK2 Response of Three Surrogates, NRL/MR/6110-09-9183*. March.

Naval Research Laboratory, 2008. *Final Report for the Evaluation of UXO Detection Technology at the Standardized UXO Test Sites Aberdeen and Yuma Proving Grounds, Standardized UXO Technology Demonstration Site Program, SERDP. NRL/MR/6110-08-9155 (EM61-MK2 Response of Standard Munitions Items)*. October.

## Appendix B

# Geophysical System Verification Plan

---

(Final)  
Attachment 1

**Geophysical System Verification Plan  
Marine Corps Air Station New River-Runway Expansion Area**

**Marine Corps Air Station New River  
Marine Corps Installations East - Marine Corps Base Camp Lejeune  
North Carolina**

**Contract Task Order WE5A**

**December 2013**

Prepared for

**Department of the Navy  
Naval Facilities Engineering Command  
Mid-Atlantic**

Under the

**NAVFAC CLEAN Program  
Contract N62470-08-D-8012**

Prepared by



**5701 Cleveland Street, Suite 200  
Virginia Beach, Virginia 23462**

# Contents

---

<b>Geophysical System Verification Plan .....</b>	<b>1</b>
1. Instrument Verification Strip .....	1
1.1 Location and Length of IVS .....	1
1.2 Industry Standard Objects .....	1
1.3 IVS Procedures.....	2
1.4 Measurement Quality Objectives .....	5
1.4.1 General System Verification .....	6
1.4.2 Data Handling .....	7
1.5 IVS Data Analysis and Interpretation.....	7
1.6 DGM Quality Control .....	7
1.7 IVS Data Evaluation and Reporting.....	7
2. Blind Seeding .....	8
2.1 Seed Placement .....	8
2.2 Validation.....	9
3. Reporting .....	9
4. References .....	9

## Tables

1	IVS Transects Descriptions and Purpose
2	IVS MQOs

## Figures

1	Small ISO
2	IVS Process
3	Generalized IVS Seeded Transect
4	IVS Layout
5	NRL (2009) Results for Small ISO Tested using EM61-MK2 Bottom Coil, Channel 2
6	QC Seed Burial Illustration

# Acronyms and Abbreviations

---

DGM	Digital Geophysical Mapping
GIP	Geophysical Investigation Plan
GPS	Global Positioning System
GSV	Geophysical System Verification
ISBC	Infantry Squad Battle Course
ISO	Industry Standard Object
IVS	Instrument Verification Strip
MCAS	Marine Corps Air Station
MCIEAST-MCB CAMLEJ	Marine Corps Base Camp Lejeune
MEC	Munitions and Explosives of Concern
MILCON	Military Construction
MPPEH	Material Potentially Presenting an Explosive Hazard
MQO	Measurement Quality Objective
mV	MilliVolt
NRL	Naval Research Laboratory
PLS	Professional Land Surveyor
QC	Quality Control
UXO	Unexploded Ordnance



# Geophysical System Verification Plan

---

The Geophysical System Verification (GSV) process is a physics-based, presumptively-selected technology process in which signal strength and sensor performance are compared to known response curves of industry standard objects (ISOs) to verify geophysical systems prior to and during site surveys. The GSV process is designed to perform initial verification of the geophysical system using an instrument verification strip (IVS) followed by a blind seeding program for continued verification throughout the field operations.

The GSV process will be implemented for DGM utilizing the EM61-MK2 in support of military construction (MILCON) activities at Munitions Response Site (MRS) MCAS NEW-RIVER-RUNWAY EXPANSION AREA at the Marine Corps Air Station (MCAS) New River, located at Marine Corps Installations East – Marine Corps Base Camp Lejeune (MCIEAST-MCB CAMLEJ) in Jacksonville, North Carolina.

## 1. Instrument Verification Strip

### 1.1 Location and Length of IVS

An area near the geophysical survey area will be selected for the IVS. The exact location of the IVS will be finalized during the initial mobilization to the site, and because of the site of the investigation area, multiple IVS locations may be established. The IVS will be set up as a series of survey lanes, each with a minimum length of 66 feet (20 meters). **Section 1.3** provides additional details on the generalized IVS set-up and construction.

### 1.2 Industry Standard Objects

The ISOs (**Figure 1**) to be used in the IVS are 1-inch by 4-inch (2.54-centimeter by 10.16 centimeter) steel pipes (McMaster-Carr part number 44615K466 [<http://www.mcmaster.com/>]) with the following specifications:

Shape: Straight Nipple, Threaded Both Ends

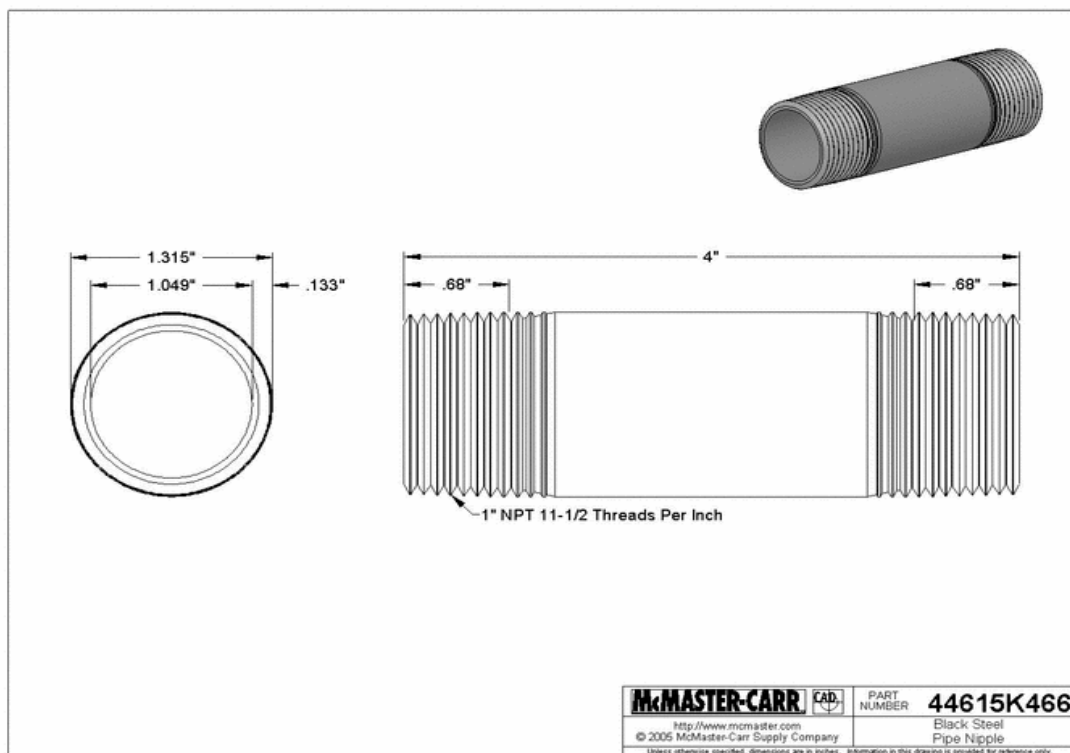
Schedule: 40

Pipe Size: 1 inch (1.315 inch outer diameter [OD])

Length: 4 inches

Finish: Black Welded Steel.

**FIGURE 1**  
**Small ISO**  
 MCAS New River, Jacksonville, North Carolina

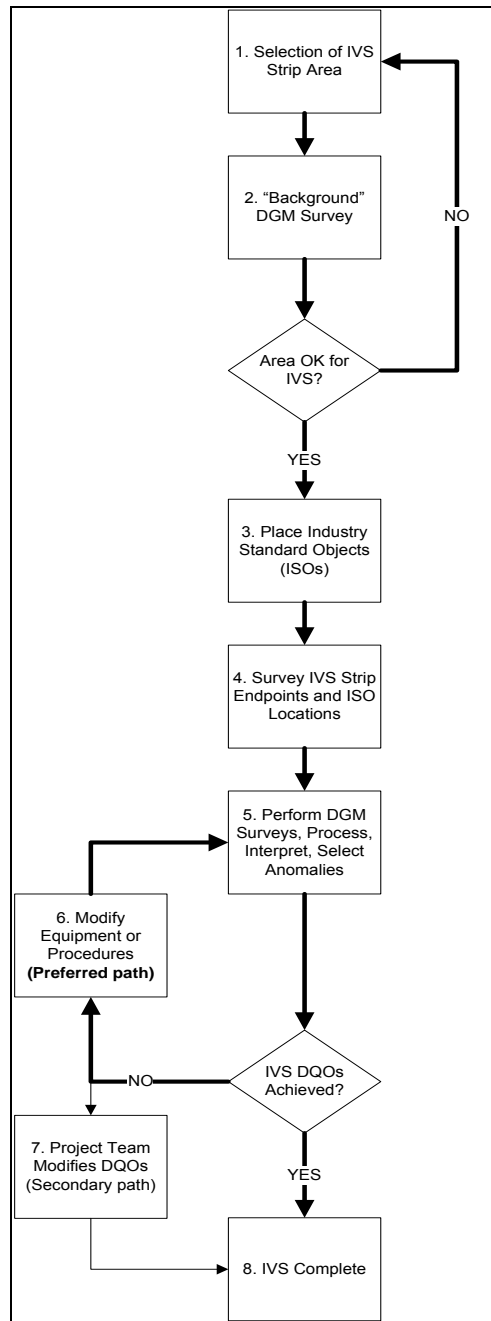


Instrument response curves for this ISO have been developed by the Naval Research Laboratory (NRL) demonstrating their standard response under their most favorable orientation (perpendicular to the EM61-MK2 instrument plane, i.e. buried vertically in the ground surface) and least favorable orientation (parallel to the instrument plane, i.e. buried horizontally and perpendicular to the direction of travel with the EM61-MK2) at a variety of distances from the instrument's bottom transmit/receive coil (NRL, 2009).

### 1.3 IVS Procedures

**Figure 2** illustrates the overall IVS process and the procedures to be employed (numbered in accordance with the steps shown on **Figure 2**) during site work.

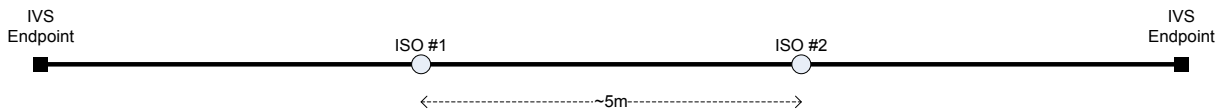
FIGURE 2  
**IVS Process**  
 MCAS New River, Jacksonville, North Carolina



1. An IVS area will be selected with preference for the following (although none of the conditions are vital for IVS success):
  - Terrain, geology, and vegetation similar to that of a majority of the geophysical survey area.
  - Geophysical noise conditions similar to those expected across the survey area.
  - Large enough site to accommodate IVS with seeds spaced at least 3 meters apart to avoid potential ambiguities in data evaluation.

- Readily accessible to project personnel.
  - Close proximity to the actual survey site (if not within the site).
- A background DGM survey will first be performed with the EM61-MK2. This step will help determine the appropriateness of the location (e.g. few existing anomalies), and will verify that ISOs are not seeded within 1 meter of existing anomalies. The data will be processed and provided to the QC Geophysicist for evaluation and approval.
  - Once the IVS area is deemed suitable for use, two small ISOs will be buried vertically at depths below ground surface (bgs) of approximately 3 and 7 times the small ISO diameter (4 inches [10 centimeters] and 9 inches [23 centimeters], respectively). The ISOs will be placed in a plastic sealable bag, identified as inert and labeled with the applicable contract number and CH2M HILL project manager contact information. These depths are intended to provide adequate signal to noise ratio for detecting the items. The generalized set-up of the seeded IVS transect is presented as **Figure 3**.

FIGURE 3

**Generalized IVS Seeded Transect***MCAS New River, Jacksonville, North Carolina*

Measurements of the item depths will be to the center of mass of each item. CH2M HILL on-site personnel will bury the ISOs using shovels to dig the holes to the appropriate depths for burial of the seed items in coordination with the QC Geophysicist. The background survey data will be reviewed in order to minimize the chances of the IVS transect start and end stakes and the seed items being placed within 1 meter of existing anomalies in the subsurface. DGM field personnel will bury the ISOs and record the emplacement depth and orientation.

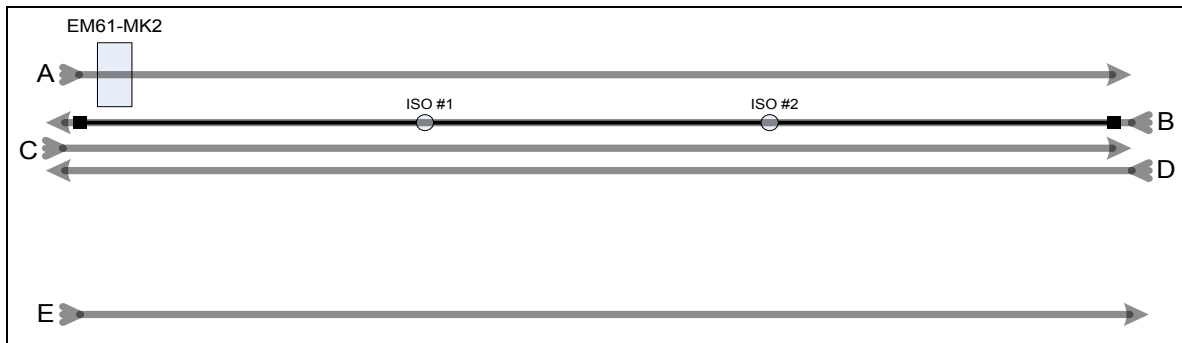
- Either the land surveying subcontractor (a licensed North Carolina professional land surveyor [PLS]) or the DGM field team will record the locations of the IVS transect start and end locations as well as the buried ISOs using RTK GPS. The holes will then be filled with soil and a vinyl-stem flag or wooden survey stake will be placed at each ISO location. If wooded stakes are used, they will not extend more than 1 foot (0.3 meter) above the ground surface so that the EM61-MK2 can easily pass over top of their locations.
- A DGM survey will be performed over the 5-line IVS using the EM61-MK2 system to be used during the investigation. The 5 lines include the transects described in **Table 1** and shown on **Figure 4**.

TABLE 1

**IVS Transect Descriptions and Purpose***MCAS New River, Jacksonville, North Carolina*

Transect	Description	Purpose
A	Offset by 2.5 feet (0.75 meter)	Demonstrate horizontal drop off of item response
B	Directly over center of strip (see <b>Figure 3</b> )	Verify response versus established response curves
C	Offset by 1.2 feet (0.375) meter (half of intended lane separation) from center of strip	Demonstrate horizontal drop off of item response
D	Offset by 2.5 feet (0.75 meter) on opposite side of strip from Transect A	Demonstrate horizontal drop off of item response
E	Offset by ~10 feet (~3 meters) from strip	Measure background noise

FIGURE 4  
**IVS Layout**  
 MCAS New River, Jacksonville, North Carolina



The IVS will be established with Transects A and D at a spacing of 2.5 feet (0.75 meter) and Transect C at a spacing of 1.2 feet (0.375 meter) relative to the center strip. Details on the production survey approaches are provided in the GIP.

The IVS 5-line survey data will be processed and interpreted by the Processing Geophysicist and provided to the QC Geophysicist within 24 hours of completion of the IVS survey.

- If the initial measurement quality objectives (MQOs) have not been met, the QC Geophysicist will discuss with the DGM field team leader whether modifications to instrumentation or procedures can be made in order to meet the MQOs.
- QC Geophysicist will discuss with the project team potential resolutions (e.g. modification of a MQO) prior to completing the IVS and beginning the production survey.
- Once the system has been determined to meet the initial (or modified) MQOs, and the Senior Geophysicist is in agreement, the IVS survey will be complete.

## 1.4 Measurement Quality Objectives

The MQOs for the IVS are presented in **Table 2**. The EM61-MK2 will not be used for site surveys until it is able to meet these MQOs or until the project team agrees on modifications to existing MQOs.

TABLE 2  
**IVS MQOs**  
 MCAS New River, Jacksonville, North Carolina

Measurement Quality Objective	Measurement Performance Criteria	Test Method During IVS
<b>General System Verification</b>		
<b>DGM System Positioning.</b> Accurate coordinates are obtained from kinematic (i.e. in-motion) DGM positioning systems.	Positional error of ISO seeds will not exceed 10 inches (25 centimeters) relative to surveyed locations.	Results of IVS DGM survey versus IVS seed locations will be evaluated for compliance (DGM only).
<b>System Munitions Detection.</b> System response is within industry standards for detection.	Response to buried ISO will not vary more than $\pm 20\%$ from known response for specific distance from sensors in static test.	Results of static tests described in GIP will be quantitatively reviewed for compliance for each system used.
	Response amplitudes collected along the IVS seeded and background transects will be comparable from one day to the next.	IVS seeded and background transects will be collected at least 2x daily as described in Section 25 of the GIP.
<b>Data Handling</b>		
Data must be delivered in a timely manner and in a useable format.	IVS survey results are delivered within 24 hours of completion of survey. Final processed packages delivered within 3 days.	Evaluated based on actual delivery of data



Additional MQOs for the production EM61-MK2 survey will be monitored through the blind seeding program and other QC tests, as discussed in the GIP. The IVS MQOs, measurement performance criteria, and test method to be used during the IVS are discussed in detail in the following subsections.

### 1.4.1 General System Verification

#### ***DGM System Positioning***

The MQO for DGM system positioning is that the resulting anomaly coordinates from the DGM survey from the seeded ISOs are at a sufficient accuracy to allow for appropriate relocation of MEC items for intrusive investigation. The measurement performance criterion for this is that the positional error at known IVS seed locations during twice daily surveying of the IVS seeded transect will not exceed 10 inches (25 centimeters).

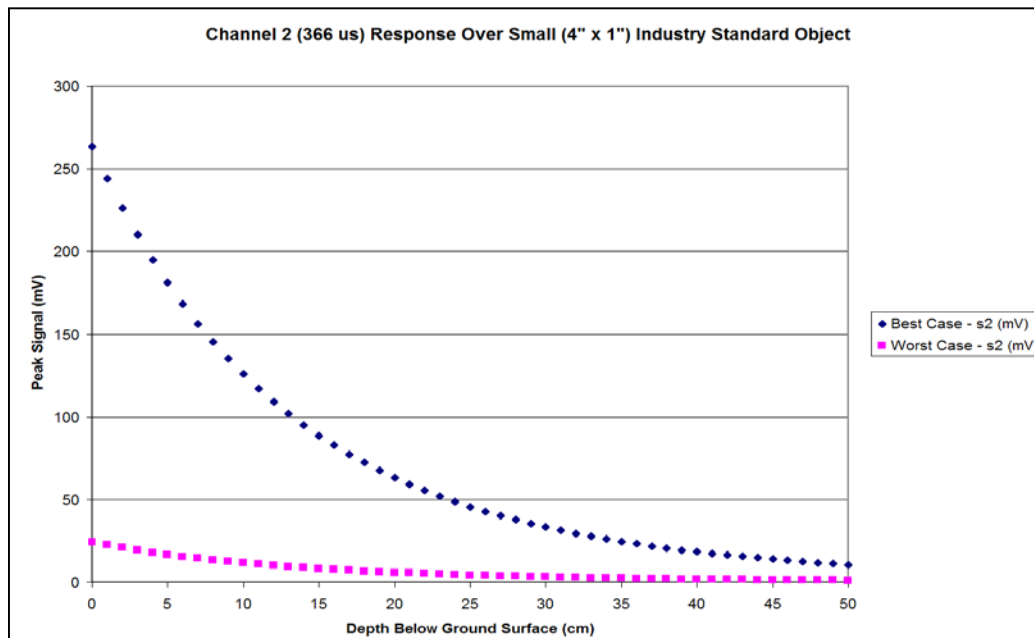
#### ***System Munitions Detection***

The MQO for munitions detection is to demonstrate that the EM61-MK2 system is capable of detecting munitions items within industry standards. This process involves demonstrating that the maximum amplitude response from an ISO falls within 20% of the predicted, published sensor response for that item (NRL, 2009). Once it has been demonstrated that the system responds comparably, a cross correlation of industry experience with detection of munitions items can be assumed. In other words, the depths and orientations of munitions items which the EM61-MK2 has been shown to be effective under test scenarios and other projects can be expected (NRL, 2008). As an example of this evaluation, **Figure 5** presents the EM61-MK2 predicted Channel 2 responses from a small ISO (NRL, 2009).

The static spike test results (discussed in the GIP) will determine whether the geophysical instrument is responding to within a specific threshold. In this test, the distance from the coil and orientation of the ISO can be strictly controlled in the field.

In addition, the responses from the buried IVS seed items will be evaluated each day in order to demonstrate that the EM61-MK2 is responding consistently to the IVS seed items throughout DGM operations. Minor variations in the sensor height as it passes over the seeded item and slight variations in the path traveled down the IVS can affect the amplitude response received from the instrument. Therefore, the responses from the seeded ISOs in the IVS will be qualitatively evaluated for person portable systems. A determination that the geophysical instrument itself is responding within a specific threshold will be based primarily on the static spike test results.

FIGURE 5  
**NRL (2009) Results for Small ISO Tested using EM61-MK2 Bottom Coil, Channel 2**  
*MCAS New River, Jacksonville, North Carolina*



## 1.4.2 Data Handling

The MQO for data handling is that data must be delivered in a timely manner and in a useable format. Because of the need for rapid feedback during IVS operations to effectively test potential DGM systems, the measurement performance criterion for data handling during IVS activities will require that initial data be completed and delivered to the PQC Geophysicist within 24 hours of data collection. Processed data for the IVS shall be delivered to the QC Geophysicist within three working days of data collection. This MQO will be evaluated based on the actual delivery of data.

## 1.5 IVS Data Analysis and Interpretation

The IVS survey data will be post-processed and analyzed in accordance with **Section 19** of the GIP.

## 1.6 DGM Quality Control

Achievement of the GSV MQOs will be verified by the QC Geophysicist. The selected IVS area, the process of emplacing the IVS items, and the survey locations will be verified through observation during the IVS set-up and execution.

The QC tests discussed in **Section 25** of the GIP will be performed as part of the GSV and IVS procedure for the DGM systems being utilized.

## 1.7 IVS Data Evaluation and Reporting

The QC Geophysicist will evaluate the IVS survey results and QC tests as the last step in the validation process.

## 2. Blind Seeding

As a continuation of the GSV process and on-going verification of the EM61-MK2 system operation, small ISOs will be used as blind seeds at a frequency of on approximately every acre (~minimum of 10 for this project).

### 2.1 Seed Placement

UXO personnel will bury seed items with a vertical orientation and at a depth of 6 inches (15 centimeters) below ground surface. Depth will be measured to the center of mass of the item, as illustrated in **Figure 6**. Depths will be recorded in field notes.

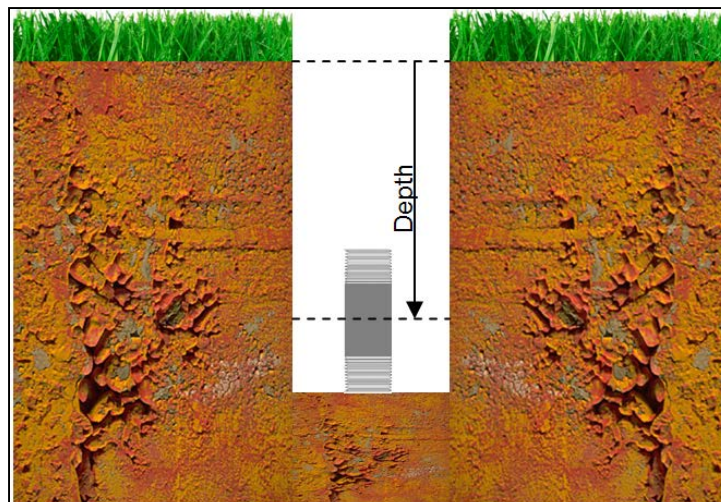
UXO personnel will utilize a White's XLT all metals detector to clear the locations of each proposed seed location in order to avoid placing the seed near a subsurface metallic object. The following also applies to the placement of the seed items:

- UXO personnel will clear the proposed seed locations to make sure there are no potentially competing subsurface anomalies that may impact the ability to successfully detect the seed items with the geophysical instruments.
- Seeds will not be placed within a 3.3 feet (1 meter) radius of an existing subsurface anomaly, surveyor stake, tree, or other physical obstruction at the surface.
- Holes will be dug by UXO personnel or by others under their direct supervision.
- The seed items will be left exposed after emplacement so that the locations may be recorded using RTK GPS by the PLS or by CH2M HILL. The recorded location will be the center of the seed items.
- The seed items will be labeled with the CH2M HILL project manager name and contact information, as well as the applicable contract number for the project. They will be placed in a sealed plastic bag or securely wrapped in non-metallic material to prevent groundwater from obscuring the labels.
- Once surveyed, the seeds will be carefully covered with soil so as to not disturb their orientation.
- No physical markers will be left in place to denote the locations of the seed items.
- The locations of the seed items will be provided to the QC Geophysicist.

FIGURE 6

**QC Seed Burial Illustration**

*MCAS New River, Jacksonville, North Carolina*



## 2.2 Validation

During review of the delivered data packages, the QC Geophysicist will overlay the locations of the blind seeds to observe whether the munitions detection and positioning MQOs are met. Should an issue be detected (such as a data trend indicating a MQO limit is being approached) or a MQO is not met, a comprehensive root-cause analysis will be performed and a corrective action determined.

## 3. Reporting

Results of the GSV process will be included in a report prepared by CH2M HILL. The report will include a summary of the IVS operations and initial validation, an as-built map of the IVS plot, discussion of the IVS and blind seeding program results.

## 4. References

Naval Research Laboratory, 2009. *EM61-MK2 Response of Three Surrogates*, NRL/MR/6110-09-9183. March.

Naval Research Laboratory, 2008. *Final Report for the Evaluation of UXO Detection Technology at the Standardized UXO Test Sites Aberdeen and Yuma Proving Grounds, Standardized UXO Technology Demonstration Site Program, SERDP*. NRL/MR/6110-08-9155 (*EM61-MK2 Response of Standard Munitions Items*). October.

## Appendix C

### Health and Safety Plan

---

**Health and Safety Plan  
Munitions Response Investigation of  
Marine Corp Air Station New River – Runway Expansion Area**

**Marine Corps Installations East - Marine Corps Base Camp Lejeune  
North Carolina**

**Contract Task Order WE5A**

**December 2013**

Prepared for

**Department of the Navy  
Naval Facilities Engineering Command  
Mid-Atlantic**

Under the

**NAVFAC CLEAN Program  
Contract N62470-08-D-8012**

Prepared by



**Charlotte, North Carolina**

# Contents

---

<b>Approval.....</b>	<b>V</b>
<b>1     Applicability.....</b>	<b>1-1</b>
<b>2     General Project Information .....</b>	<b>2-1</b>
2.1     Project Information and Background .....	2-1
2.2     Site Background, Setting, and Map .....	2-1
2.3     Description of Tasks.....	2-1
2.4     Change Management .....	2-3
2.5     Changes to Health and Safety Plans .....	2-3
2.6     Daily Safety Meetings and Pre-Task Safety Plans .....	2-3
<b>3     Project Organization and Responsibilities .....</b>	<b>3-1</b>
3.1     Client.....	3-1
3.2     CH2M HILL .....	3-1
3.3     CH2M HILL Subcontractors.....	3-1
3.4     Client Contractors.....	3-1
<b>4     Standards of Conduct .....</b>	<b>4-1</b>
<b>5     Project Hazard Analysis .....</b>	<b>5-1</b>
<b>6     Hazards and Controls .....</b>	<b>6-1</b>
6.1     Avoidance of Munitions and Explosives of Concern (MEC) and/or Material Potentially Presenting an Explosive Hazard (MPPEH).....	6-1
6.1.1     Hazard Identification .....	6-1
6.1.2     Hazard Mitigation/Prevention.....	6-1
6.1.3     MEC Avoidance Procedures.....	6-3
6.2     Fact Sheet .....	6-3
<b>7     Hazard Communication .....</b>	<b>7-1</b>
<b>8     Site Monitoring.....</b>	<b>8-1</b>
8.1     Direct Reading Monitoring Specifications .....	8-1
8.2     Heat Stress Monitoring Flow Chart .....	8-2
<b>9     Personal Protective Equipment.....</b>	<b>9-1</b>
9.1     Required Personal Protective Equipment .....	9-1
<b>10    Worker Training and Qualification .....</b>	<b>10-1</b>
10.1    CH2M HILL Worker Training .....	10-1
10.2    Subcontractor Worker Training.....	10-2
10.3    HAZWOPER-Exempted Tasks .....	10-3
<b>11    Medical Surveillance and Qualification .....</b>	<b>11-1</b>
<b>12    Site-Control Plan .....</b>	<b>12-1</b>
<b>13    Communications .....</b>	<b>13-1</b>
<b>14    Required Facilities and Equipment.....</b>	<b>14-1</b>
<b>15    Emergency Response Plan .....</b>	<b>15-1</b>



<b>16</b>	<b>Incident Notification, Reporting, and Investigation .....</b>	<b>16-1</b>
16.1	Incident Notification .....	16-1
16.2	Drug and Alcohol Testing for CH2M HILL Employees .....	16-1
16.3	Drug and Alcohol Testing for Subcontractors.....	16-1
16.4	HITS System and Incident Report Form .....	16-2
16.5	Injury Management/Return-to-Work (for US/Puerto Rico based CH2M HILL Staff Only) .....	16-2
16.6	Serious Incident Reporting Requirements.....	16-2
<b>17</b>	<b>Inspections .....</b>	<b>17-1</b>
17.1	Project Activity Self-Assessment Checklists.....	17-1
17.2	Safe Behavior Observations.....	17-1
<b>18</b>	<b>Records and Reports .....</b>	<b>18-1</b>
<b>19</b>	<b>Employee Signoff Form .....</b>	<b>19-1</b>

#### **Attachments**

A	ESBG HSSE Guidelines
B	Project Forms/Templates
C	Fact Sheets
D	Project Activity Self-Assessment Checklists

## 24-hour CH2M HILL Injury Reporting– 1-866-893-2514

### 24-hour CH2M HILL Serious Incident Reporting Contact – 720-286-4911

<b>Medical Emergency – 911</b>		<b>CH2M HILL- Medical Consultant</b>
<b>Hospital ER (On-Base) #:</b>	(910) 451-4840 (910) 451-4841 (910) 451-4842	WorkCare Dr. Peter Greaney M.D. 300 S. Harbor Blvd, Suite 600 Anaheim , CA 92805 800-455-6155/866-893-2514 714-978-7488
<b>Onslow County ER (Off-Base) #:</b>	(910) 577-2240	
<b>Ambulance (On-Base) #:</b>	(910) 451-3004 (910) 451-3005	
<b>Ambulance (Public) #:</b>	(910) 451-9111	
<b>LEPC (Poison Control)#:</b>	(800) 222-1222#:	
<b>Fire/Spill Emergency – 911</b>		<b>CH2M HILL Director – Health, Safety, Security &amp; Environment</b>
<b>Base Fire Response #:</b>	(910) 451-9111	Andy Strickland/DEN (720) 480-0685 (cell) or (720) 286-2393 (office)
<b>Security &amp; Police – 911</b>		<b>CH2M HILL Responsible Health and Safety Manager (RHSM)</b>
<b>Base Security #:</b>	(910) 451-2555	Name: Carl Woods/CIN Phone: (513) 319-5771
<b>Utilities Emergency Phone Numbers</b>		<b>CH2M HILL Human Resources Department</b>
Water: (910) 451-9111		Phone: Employee Connect toll-free number
Gas: (910) 451-9111		1-877-586-4411
Electric: (910) 451-9111		(U.S. and Canada)
<b>CH2M HILL Project Manager</b>		<b>CH2M HILL Worker's Compensation:</b>
Name: Noah Weinberg/NWO		Contact Business Group HR dept. to have form completed
Phone: 623-521-4503		or contact Jennifer Rindahl after hours: (720)891-5382
<b>CH2M HILL Safety Coordinator (SC)</b>		<b>Media Inquiries Corporate Strategic Communications</b>
Name: Jake Crostic/CLT		Name: John Corsi
Phone: (864) 380-7264		Phone: (720) 286-2087
<b>CH2M HILL Project Environmental Manager</b>		<b>Automobile Accidents</b>
Name: Hope Wilson		Rental: Jennifer Rindahl/DEN: 720-286-2449
Phone: (678) 530-4226		CH2M HILL owned vehicle: Linda George/DEN: 720-286-2057
<b>Federal Express Dangerous Goods Shipping</b>		<b>CHEMTEL (hazardous material spills)</b>
Phone: 800/238-5355		<b>Phone: 800/255-3924</b>
Facility Alarms: TBD		Evacuation Assembly Area(s): TBD by the SC-HW

Facility/Site Evacuation Route(s): follow main roads towards access gates and off the Base

#### Directions to Local Hospital

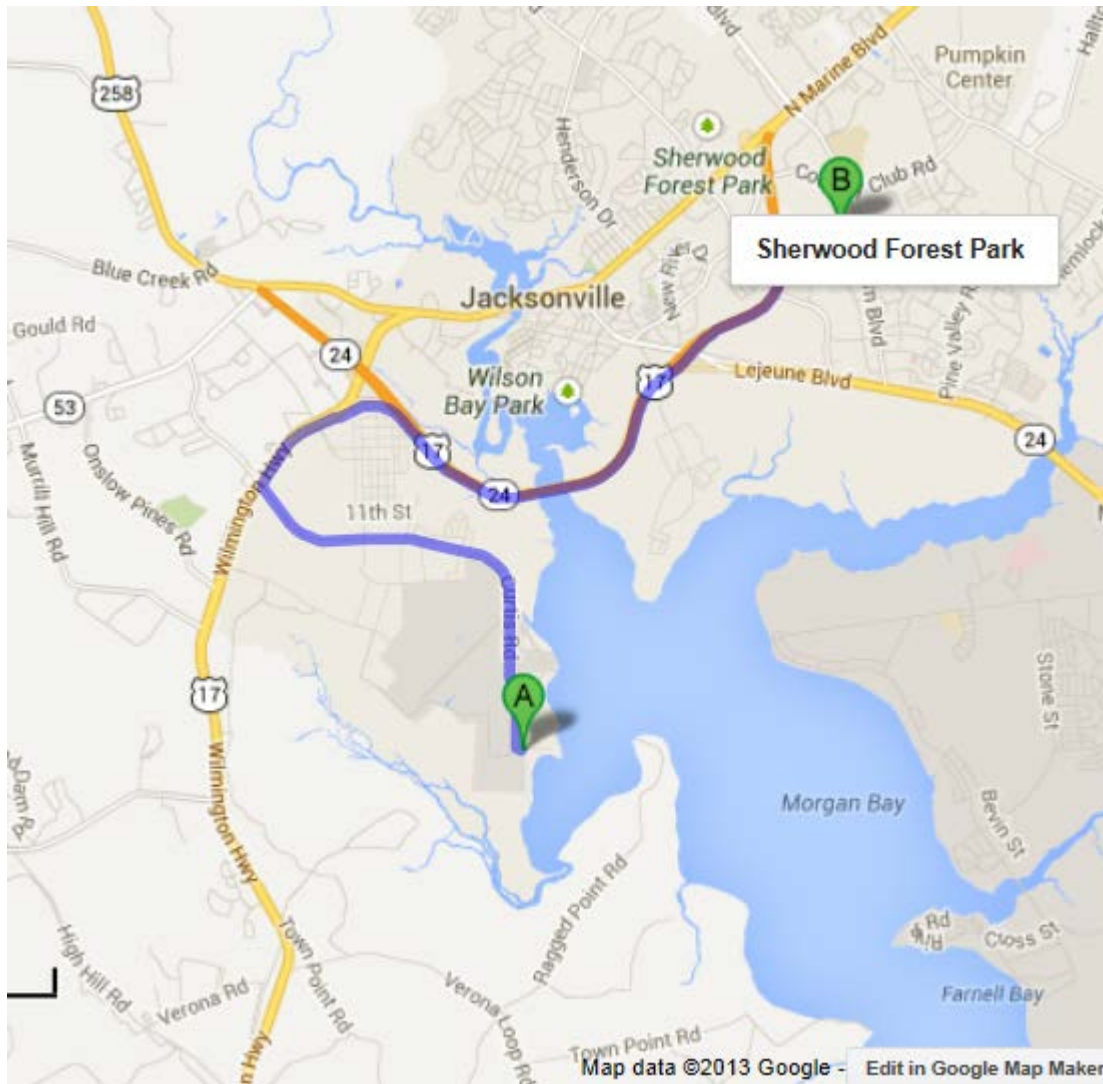
##### Local Hospital

**Nearest On-Base hospital:**  
Base Naval Hospital (only to be used in extreme emergency)  
100 Brewster Blvd., Building NH100  
Camp Lejeune, NC 28547  
Phone: (910) 451-4840, (910) 451-4841, (910) 451-4842

**Local hospital:**  
Onslow County Memorial Hospital  
317 Western Boulevard  
Jacksonville, NC 28546  
Phone: (910) 577-2240  
**Local ambulance service:**  
Base Ambulance: (910) 451-3004, (910) 451-3005  
Public Ambulance: (910) 451-9111

**Directions to Onslow County Memorial Hospital:**

1. Head west on Curtis Rd toward Demarco Street
2. Take the 1<sup>st</sup> right to stay on Curtis Rd
3. Turn right onto US-17 N
4. Take the N Carolina 24 E/US-17 N ramp to Camp Lejeune/Morehead City/New Bern
5. Merge onto US-17 N
6. Take the exit
7. Turn Right
8. Take the 1<sup>st</sup> Left
9. Turn Right



# Approval

---

This Health and Safety Plan (HSP) has been written for use by CH2M HILL only. CH2M HILL claims no responsibility for its use by others unless that use has been specified and defined in project or contract documents. The plan is written for the specific project and site conditions and identified scope(s) of work and must be amended if those conditions or scope(s) of work change.

By approving this HSP, the Responsible Health and Safety Manager (RHSM) certifies that the personal protective equipment has been selected based on the project-specific hazard assessment.

## ORIGINAL PLAN

Original Plan Written by: Carl Woods

Date: 7/25/13

---

RHSM Approval: Carl Woods

Date: 7/25/13

---

Project Manager Approval: Noah Weinberg

Date: 8/1/13

---

## REVISIONS:

Revisions Made By:

Date:

---

Description of Revisions to Plan:

Revisions Approved By:

Date:

---

## SECTION 1

# Applicability

---

This HSP applies to:

- All CH2M HILL staff, including subcontractors and tiered subcontractors of CH2M HILL working on the site
- All visitors to CH2M HILL construction sites in the custody of CH2M HILL (including visitors from the Client, the Government, the public, and other staff of any CH2M HILL company).

In addition, Subcontractors and tiered subcontractors shall also follow any of their company HSE programs, and site-specific HSPs and AHAs.

This HSP does not apply to the third-party contractors, their workers, their subcontractors, their visitors, or any other persons not under the direct control or custody of CH2M HILL.

This HSP defines the procedures and requirements for the health and safety of CH2M HILL staff and visitors when they are physically on the work site. The work site includes the project area (as defined by the contract documents) and the project offices, trailers, and facilities thereon.

This HSP will be kept onsite during field activities and will be reviewed as necessary. The HSP will be revised as project activities or conditions change or when supplemental information becomes available. The HSP adopts, by reference, the CH2M HILL Enterprise-wide Core Standards and Standard Operating Procedures (SOPs), Attachment D of the Work Plan as appropriate. In addition, applicable requirements contained in the Environmental Services Business Group (ESBG) Health, Safety, Security, and Environment (HSSE) Guidelines (Guidelines), will be implemented. The Guidelines are attached to this HSP as **Attachment A**. The HSP may adopt procedures from the project Work Plan and any governing regulations. If there is a contradiction between this HSP and any governing regulation, the more stringent and protective requirement shall apply.

All CH2M HILL staff and subcontractors must sign the employee sign-off form (Section 19 of this HSP) to acknowledge review of this document. Copies of the signature page will be maintained onsite by the Safety Coordinator (SC).

## SECTION 2

# General Project Information

---

## 2.1 Project Information and Background

<b>Project Number:</b> 476480	<b>Project/Site Name:</b> Munitions Response Investigation of Marine Air Station New River-Runway Expansion Area
<b>Client:</b> NAVFAC - Atlantic	<b>Site Address:</b> MCB Camp Lejeune, Jacksonville, NC 28542
<b>CH2M HILL Project Manager:</b> Noah Weinberg/NWO	<b>CH2M HILL Office:</b> Charlotte, NC
<b>DATE HSP Prepared:</b> 07/9/13	<b>Date(s) of Site Work:</b> Sept 2013-Aug 2014

## 2.2 Site Background, Setting, and Map

MCAS New River-Runway Expansion Area encompasses approximately 10.4 acres of land located south of MCAS New River and on the west bank of Morgan Bay on the New River. Based on a review of publicly available aerial photographs and site reconnaissance, the topography of MCAS New River-Runway Expansion Area is relatively flat and contains well-manicured grass. The topography is characterized by low elevations and relatively low relief. Surface elevations range from approximately 20 to 40 feet above mean sea level. The area within MCAS New River-Runway Expansion Area is used for roadways for support facilities around MCAS New River. Support facilities include: runway maintenance shops, marinas, and recreational parks.

**Figure 2-1** shows the site boundary, MCAS New River, and encumbering former ranges.

## 2.3 Description of Tasks

Below is a description of the tasks covered by this plan. Any additions or changes in scope will require a revision to this HSP; see Change Management below.

Scope of work covered by this HSP includes:

- Site Oversight by Safety Officers
- Site Preparation (Survey and Utility Locate) and Restoration
- Performance of DGM over 100 percent of the roadway, utility, and fencepost areas (6.2 acres)
- Inspection of 200 cubic yards of soil for MEC/MPPEH
- MEC Investigation of subsurface anomalies
- Collection of composite surface soil samples from post detonation sampling locations

Insert Figure 2-1



## 2.4 Change Management

Changes to this HSP shall be documented and approved by the project CH2M HILL Responsible Health and Safety Manager. The following are examples of changes that may require a revision to the plan:

- Change in CH2M HILL staff;
- New subcontractor to perform work;
- New chemicals brought to site for use;
- Change in scope or addition of new tasks;
- New hazards or hazards not previously identified that are not addressed in this HSP.

## 2.5 Changes to Health and Safety Plans

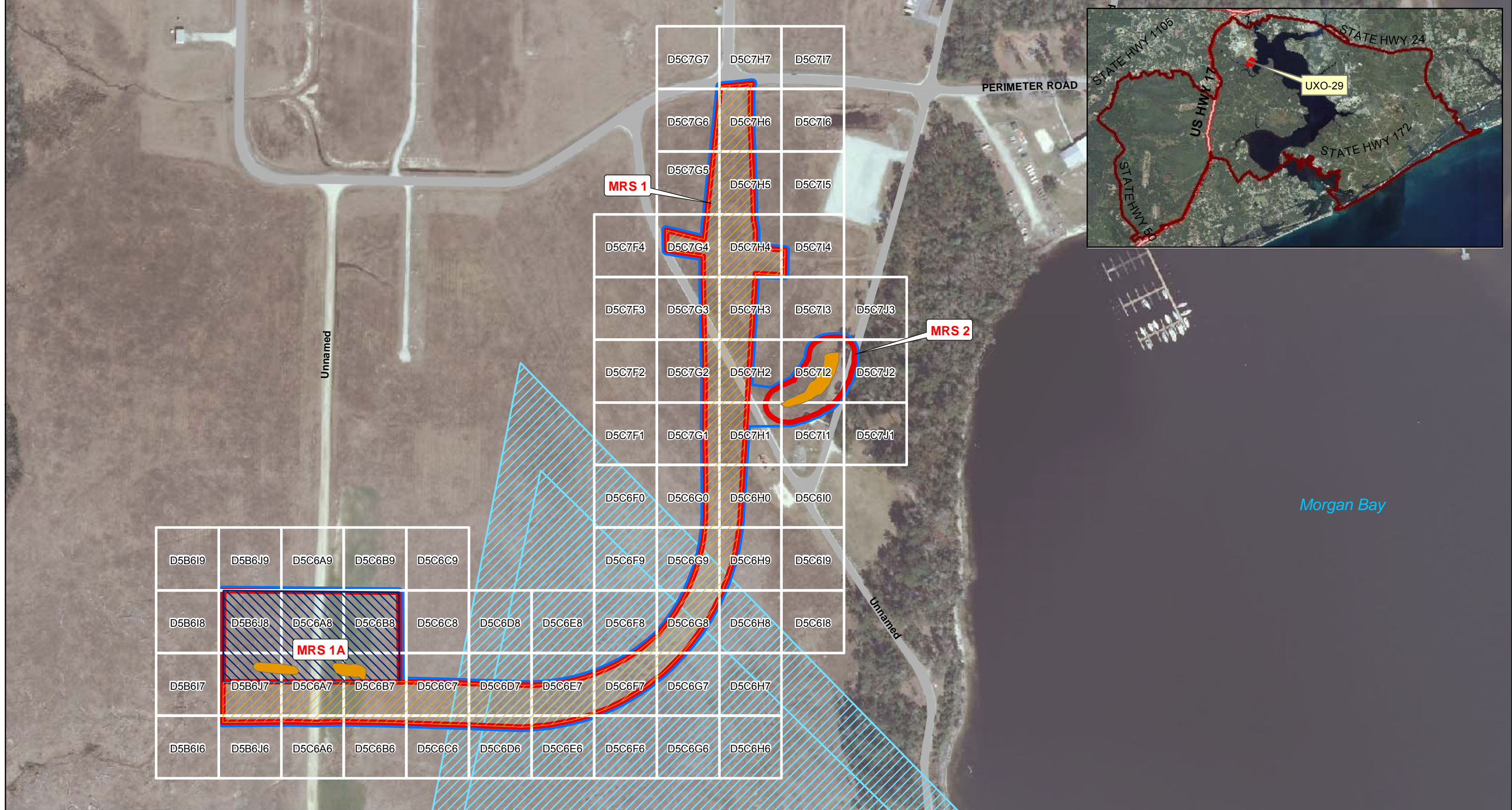
Changes to the HSP shall be documented and accepted by using the Health and Safety Field Change Request (FCR) form (included in Attachments) or by resubmitting a revised HSP for acceptance. A revised HSP should be produced when a large number of changes (e.g., 15 or more not including AHAs) using FCRs has been employed. The CH2M HILL Project Manager (PM) and RHSM shall be responsible for the review and acceptance of the FCR, and the RHSM will maintain an FCR log of approved changes. Field Change Requests are not required for safety-related changes that a Safety Coordinator (SC) or RHSM would normally make in the field, such as upgrade or downgrade to PPE within pre-established action levels, expansion or reduction of work control zones based on air monitoring results, and similar changes made within the operating parameters of the HSP. The field copy of the HSP shall be kept up to date by annotating the appropriate section (i.e., update to AHA) to indicate that an FCR is in effect; copies of FCRs should be kept with the HSP. The FCR number must be referenced in the HSP and available for review.

## 2.6 Daily Safety Meetings and Pre-Task Safety Plans

Safety meetings are to be held with all project personnel in attendance to review the hazards, controls, and required procedures/AHAs that apply for each day's activities:

- Everyone involved in the day's work needs to sign a sign-in form to show they've had a briefing/attended a meeting.
- Pre-Task Safety Plans (PTSPs) serve the same purpose as general safety meetings, but the PTSPs are completed by individual crews to focus on those hazards posed by their specific work.
- For smaller crews, or if there is just one activity, the PTSP is often used as a means to document the overall Safety Meeting.

A copy of the PTSP and Daily Safety Meeting sign-in sheet is included in the Project Forms/Templates, **Attachment B**.



**Legend**

- Stockpiled Soil
- 50 meter grid
- DGM
- Stockpiled Soil Area
- B-17, Former Infantry Weapons Demonstration Course
- MRS Boundary
- MRA Boundary

0 125 250 500 Feet

1 inch = 250 feet

Figure 3-1  
DGM Soil Pile Map  
Work Plan Addendum for MCAS New River-Runway Expansion Area  
MCIEAST-MCB CAMLEJ  
North Carolina

CH2MHILL

## SECTION 3

# Project Organization and Responsibilities

A full description of responsibilities, including Employee Responsibilities and Authority, can be found in the **Attachment A**, Guidelines, Section 3, “Roles and Responsibilities.”

## 3.1 Client

<b>Contact Name:</b>	Bryan Beck
<b>Phone:</b>	(757) 322-4734
<b>Facility Contact Name:</b>	NAVFAC Mid-Atlantic

## 3.2 CH2M HILL

Project Manager:	
<b>PM Name:</b>	Noah Weinberg
<b>Office:</b>	NWO
<b>Telephone number:</b>	(504) 593-9421
<b>Cellular Number:</b>	(623) 521-4503

Environmental Manager:	
<b>EM Name:</b>	Hope Wilson
<b>Office:</b>	ATL
<b>Telephone number:</b>	(678) 530-4226
<b>Cellular Number:</b>	(678) 656-5411

Responsible Health and Safety Manager:	
<b>RHSM Name:</b>	Carl Woods
<b>Office:</b>	CIN
<b>Telephone number:</b>	513-889-5771
<b>Cellular Number:</b>	513-319-5771

Safety Coordinator:	
<b>SC Name:</b>	Jake Crostic
<b>Office:</b>	CLT
<b>Telephone</b>	(704) 543-3275
<b>Cellular Number:</b>	(864) 380-7264

## 3.3 CH2M HILL Subcontractors

Subcontractor: DGM	
<b>Contact Name:</b>	TBD
<b>Telephone number:</b>	
<b>Cellular Number:</b>	

Subcontractor: USA Environmental, INC.	
<b>Contact Name:</b>	Thomas Bourque
<b>Telephone</b>	941-746-5375
<b>Cellular Number:</b>	808-255-2320

Subcontractor: Surveyor	
<b>Contact Name:</b>	TBD
<b>Telephone number:</b>	
<b>Cellular Number:</b>	

## 3.4 Client Contractors

Client Contractor: N/A	
<b>Contact Name:</b>	
<b>Telephone number:</b>	
<b>Cellular Number:</b>	

Client Contractor: N/A	
<b>Client Name:</b>	
<b>Telephone</b>	
<b>Cellular Number:</b>	

This HSP does not cover contractors that are contracted directly to the client or the owner. CH2M HILL is not responsible for the health and safety or means and methods of the client contractor’s work, and does not assume such responsibility through its actions (such as advising on health and safety issues).

#### SECTION 4

## Standards of Conduct

---

All individuals associated with this project must work injury-free and drug-free and must comply with the standards of conduct stated in the **Attachment A**, Guidelines, (Section 4, “Standards of Conduct”), comply with all requirements of this HSP, and Subcontractors must also comply with the safety requirements of the Subcontractor HSP. Forms related to Subcontractor Safety (i.e., Observation Hazard Form and Stop Work Order Form) are attached to this HSP.



## SECTION 5

# Project Hazard Analysis

A health and safety risk analysis (Table 1) has been completed for this project. Specific project activities are listed in Table 1 with a designation of who performs the task, CH2M HILL (C) or Subcontractor (S). An Activity Hazard Analysis has been developed for each project activity. AHAs prepared for CH2M HILL activities are included as an attachment to this HSP.

CH2M HILL subcontractors are required to provide AHAs specific to their scope of work on the project for acceptance by CH2M HILL prior to the start of work. Each subcontractor shall submit AHAs for their field activities, as defined in their scope of work, along with their project-specific safety plan and procedures.

TABLE 1  
Health and Safety Risk Analysis Table

Associated Hazard Section	Oversight of Safety	Site Prep (Survey and Utility Clearance) and Restoration	DGM	Subsurface MEC Investigation	Surface Soil Sampling
<b>General Hazards – Refer to General Hazards and Controls in HSSE Guidelines, Section 7.</b>					
Bloodborne Pathogens	C	S	S	S	C
Driving Safety	C	S	S	S	C
Electrical Safety	C			S	
Field Vehicles	C	S	S	S	C
Fire Prevention	C	S	S	S	C
General Practices and Housekeeping	C	S	S	S	C
Hazard Communication	C				
Knife Use	C	S	S	S	C
Lighting	C	S	S	S	C
Manual Lifting	C	S	S	S	C
Personal Hygiene	C	S	S	S	C
Personal Security	C				
Shipping and Transportation of Hazardous Waste	C			S	C
Substance Abuse	C	S	S	S	C
<b>Project-Specific Hazards – Refer to HSSE Guidelines, Section 8, and the additional project-specific controls in this plan when specified.</b>					
Blasting/Explosives	C			S	
Demolition	C			S	
Drum and Portable Tank Handling	C			S	C
Drum Sampling Safety	C			S	C
Earthmoving Equipment	C			S	
Excavations	C			S	

TABLE 1  
Health and Safety Risk Analysis Table

Associated Hazard Section	Oversight of Safety	Site Prep (Survey and Utility Clearance) and Restoration	DGM	Subsurface MEC Investigation	Surface Soil Sampling
Firearms, Explosives and Weapons	C			S	
Flight Line Safety	C	S	S	S	C
Hand and Power Tools	C	S	S	S	C
MEC/MMPEH/Munitions Response	C			S	
Off-Road Driving Safety	C	S	S	S	C
Pressurized Lines/Equipment	C			S	
Steep Slopes and Uneven Walking Surfaces	C	S	S	S	
Traffic Control	C	S	S	S	
Utilities (underground)	C			S	
Working around Material Handling Equipment	C			S	
<b>Physical Hazards – Refer to Physical Hazards in HSSE Guidelines, Section 9, and the additional project-specific controls in this plan when specified.</b>					
Noise	C			S	
Ultraviolet Light exposure (sunburn)	C	S	S	S	C
Temperature Extremes	C	S	S	S	C
<b>Biological Hazards – Refer to Biological Hazards in HSSE Guidelines, Section 10, and the additional project-specific controls in this plan when specified.</b>					
Bees and Other Stinging Insects	C	S	S	S	C
Fire Ants	C	S	S	S	C
Mosquito Bites	C	S	S	S	C
Poison Ivy, Oak and Sumac	C	S	S	S	C
Snakes	C	S	S	S	C
Spiders – Brown Recluse and Black Widow	C	S	S	S	C
Ticks	C	S	S	S	C

C – Hazard section applicable to CH2M HILL personnel

S – Hazard section applicable to Subcontractor personnel

## SECTION 6

# Hazards and Controls

---

Safe work practices and hazard control measures to reduce or eliminate potential hazards as identified in Table 1 are stated in the **Appendix A**, Guidelines, Sections 7-10; Appendix E, the associated CH2M HILL SOP; and are addressed in Appendix E, project AHAs. Any additional project-specific control measures, or those hazards requiring additional emphasis, are identified in the following sections.

Always consult the appropriate CH2M HILL Enterprise SOP to ensure all requirements are implemented. CH2M HILL employees and subcontractors must remain aware of the hazards affecting them regardless of who is responsible for controlling the hazards. CH2M HILL employees and subcontractors who do not understand any of these provisions should contact the RHSM for clarification.

## 6.1 Avoidance of Munitions and Explosives of Concern (MEC) and/or Material Potentially Presenting an Explosive Hazard (MPPEH)

(Reference CH2M HILL, SOP HSE-610, *Explosives Usage and Munitions Response*)

If work will be conducted on a government/military facility or ex-government/military facility; area currently or previously used as a range; or if military munitions, MEC, or unexploded ordnance (UXO) are associated with the scope of work or location immediately contact the CH2MHILL Central Point of Contact for Explosives Usage and Munitions Response. The following will be required prior to any field work:

- Setting up a conference call with all required personnel to conduct a basic safety risk assessment over the phone.
- Providing written directions detailing job-specific requirements and what actions to take to ensure safety during the work.
- “3R Training” will be required for all affected project personnel. This training teaches personnel to Recognize, Retreat, and Report.

### 6.1.1 Hazard Identification

The nature of activities on this project will result in the potential of encountering Munitions and Explosives of Concern (MEC) and Material Potentially Presenting an Explosive Hazard (MPPEH) items that have been fired, disposed, or abandoned, but may still represent a hazard. Non-Unexploded Ordnance (UXO) trained personnel will avoid all contact with MEC/MPPEH.

The Explosives Safety Submission (ESS) Amendment for Firing Position Owl covers the types of munitions likely used and the intrusive activities at the MRA. All work will follow the approved Work Plan Addendum, which is based on the DDESB-approved ESS Amendment.

### 6.1.2 Hazard Mitigation/Prevention

All field personnel will be given munitions recognition training prior to working on the site. The training will be verified by signature on the site training form. Personnel will be instructed to be alert for MEC/MPPEH. The following general precautions concerning suspect MEC will be observed at all times:

- Suspect MEC item(s) WILL NOT be touched or moved regardless of the markings or apparent condition. Only UXO trained personnel are allowed to handle MEC/MPPEH.
- Radios or cellular phones WILL NOT be used in the vicinity of suspect MEC items.



- Areas where the ground cannot be seen WILL NOT be traveled across without escort.
- Vehicles WILL NOT be driven into suspected MEC areas; clearly marked lanes will be used.
- Matches, cigarettes, lighters, or other flame-producing devices WILL NOT be carried on to a munitions response site (MRS).
- Color codes WILL NOT be relied upon for positive identification of MEC items or their contents.
- Suspect MEC items will be approached from the side whenever possible; approaching the front or rear areas will be avoided.
- Personnel will always assume that a MEC item contains a live charge until it can be determined otherwise.
- Earth Moving Equipment (EME) Operations within an EZ will be performed under the supervision of a UXO technician III
- EME will not be used to excavate soils within 12 inches of an anomaly.
- Anomaly investigation personnel are not permitted to enter an excavation greater than four feet in depth. If an investigation needs to be performed in an excavation deeper than four feet, operations at that work area will be halted and the Site Safety & Health Officer (SSHO) will be notified. If further investigation is warranted, the SSHO will notify the Health & Safety Manager (HSM) to determine the appropriate safety measures (e.g. sloping, shoring, etc.) to be implemented. The implementation of excavation safety provisions will require an amendment to this HSP.
- When anomaly investigation personnel must be in the area of EME:
  - Sufficient separation between ground support personnel and operating EME must be maintained.
  - Wear reflective vests or high visibility clothing to promote visibility of ground personnel by equipment operators.
  - Isolate equipment swing areas from workers, fixed objects or other equipment. Ground personnel shall avoid positioning themselves between fixed object and operating equipment.
  - Make/maintain eye contact with operators before approaching equipment. Do not approach equipment from rear or from blind spot of operator. Stay out of the swing radius of operating heavy equipment.
  - Suspended loads shall not be passed over ground personnel and ground personnel shall not walk under or in front of suspended loads.

The following actions will be taken if munitions are found:

- Personnel who are not UXO-qualified will note the area of concern, and leave the immediate vicinity. They WILL NOT touch, move, or otherwise disturb the item.
- Personnel should not be misled by markings on the munitions item stating or indicating that the item is a practice bomb or inert. Even practice bombs may have explosive charges that are used to mark/spot the point of impact, or the item could be incorrectly marked.
- Immediately upon locating any suspect MEC, the Senior UXO Supervisor (SUXOS) and UXO Safety Officer (UXOSO) will be notified. In turn, the SUXOS will notify the Project Manager who will then provide required notifications to the client.
- Operations in the immediate area of the suspect MEC will be halted and the appropriate procedures (as described below) will be implemented.

Removal and disposal of MEC is part of this scope of work and will be undertaken by a MEC support contractor under the oversight of CH2M HILL UXO qualified personnel. MEC will be consolidated, demilitarized, and disposed of in accordance with procedures outline in the approved Work Plan Addendum and ESS.

When MEC is detected and identified as potentially loaded with explosives, chemicals, propellant or pyrotechnics, or when a buried object is exposed and cannot be identified as non-MEC, the MEC support contractor will coordinate with the CH2M HILL SUXOS for assistance. The location of the object will be marked with a yellow survey marker flag and all investigation activities at that location will cease. The MEC support contractor will maintain site access control and ensure personnel safety until Explosive Ordnance Disposal (EOD) Personnel arrive and take control of the site. The contractor must supply the GPS coordinates for each item upon arrival of the Emergency Response Team. The GPS positions must also be noted in the final report. The contractor will allow the Government EOD personnel sufficient time to complete field evaluation, render safe, recover and dispose of MEC, per incident, when MEC that cannot be identified is detected.

### 6.1.3 MEC Avoidance Procedures

MEC avoidance operations will be required for select non-intrusive tasks associated with the investigation. Avoidance operations will consist of a team composed of one or more UXO Technicians. **Contact with MEC is prohibited during avoidance activities.** Attachment D of the Work Plan provides Standard Operating Procedure (SOP) applicable to avoidance procedures.

## 6.2 Fact Sheet

**Attachment C** contains a fact sheet containing pertinent information regarding ticks and vehicle safety.

## SECTION 7

# Hazard Communication

---

As indicated in Section 7, “Hazard Communication,” in the Guidelines, the hazard communication (HazCom) coordinator (the SC or qualified designee) must perform the following (additional HazCom duties are outlined in the Guidelines):

- Complete an inventory of chemicals brought on site by CH2M HILL using the chemical inventory form included as an attachment to this HSP;
- Confirm that an inventory of chemicals brought on site by CH2M HILL subcontractors is available;
- Before or as the chemicals arrive on site, obtain a Safety Data Sheet (SDS) for each hazardous chemical and include on the chemical inventory sheet (attached to this HSP) and add the SDS to the SDS attachment section of this HSP;
- Give employees required chemical-specific HazCom training using the chemical-specific training form included as an attachment to this HSP.

## SECTION 8

# Site Monitoring

(Reference CH2M HILL SOP HSE-207, Exposure Monitoring for Airborne Chemical Hazards)

For each task listed in the table below, perform the associated monitoring ensuring the equipment is calibrated daily according to the manufacturer's recommendations. Use the Daily Site Monitoring Form (or equivalent) to document the calibration and the readings taken. Retain area monitoring readings with project records.

Exposure records (breathing zone and personal air sampling) must be preserved for the duration of employment plus thirty years. Copies of all project exposure records (e.g., copies of Daily Site Monitoring form or field logbook pages where breathing zone readings are recorded along with associated calibration) shall be sent to the Sector Safety Program Assistant (SPA) for retention and also maintained in the project files.

Subcontractors are responsible for monitoring and performing integrated personal sampling for their employees as documented in their HSP or, if permitted, according to the table below.

## 8.1 Direct Reading Monitoring Specifications

Instrument	Tasks	Action Levels <sup>a</sup>	Action to be Taken when Action Level reached	Frequency <sup>b</sup>	Calibration
Noise-Level Monitor <sup>c</sup>	Operating heavy equipment	<85 dB(A) 85-120 dB(A) 120 dB(A)	No action required Hearing protection required Stop; re-evaluate	Initially and periodically during task	Daily
Heat Stress Monitor - Refer to Flow Chart Below <input checked="" type="checkbox"/> Ambient Temperature <input checked="" type="checkbox"/> Heat Index <input type="checkbox"/> WBGT <input checked="" type="checkbox"/> Physiological <input type="checkbox"/> Pulse <input type="checkbox"/> Temperature	All	Refer to the Guidelines for the type of monitoring conducted.	Refer to the Guidelines for the type of monitoring conducted.	When Heat Index reaches criteria.	

<sup>a</sup> Action levels apply to sustained breathing-zone measurements above background.

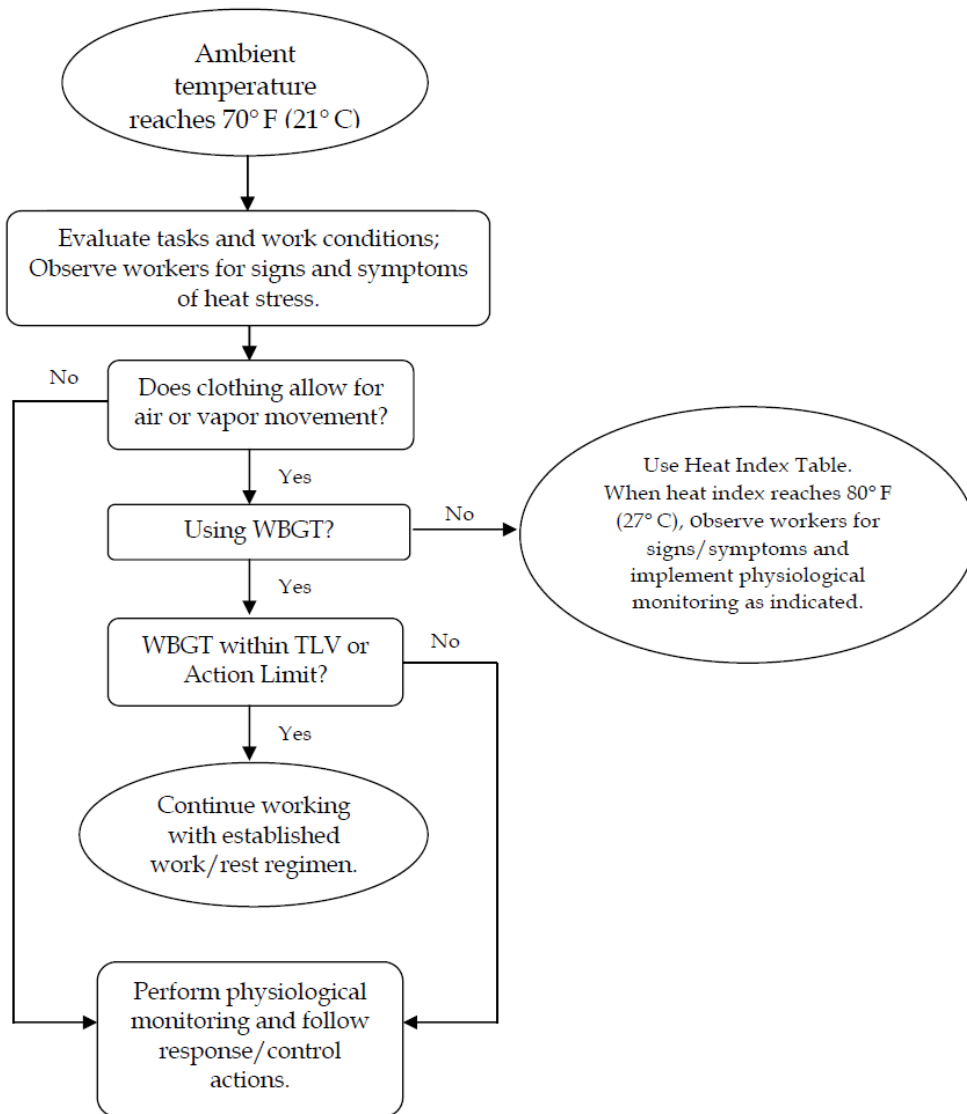
<sup>b</sup> The exact frequency of monitoring depends on field conditions and is to be determined by the SC; generally, every 5 to 15 minutes if acceptable; more frequently may be appropriate.

<sup>c</sup> Noise monitoring and audiometric testing also required.

## 8.2 Heat Stress Monitoring Flow Chart

Use the flow chart below and refer to the applicable protocol in Section 9 of the Guidelines for heat stress monitoring.

### Thermal Stress Monitoring Flow Chart



## SECTION 9

# Personal Protective Equipment

(Reference CH2M HILL- SOP HSE-117, Personal Protective Equipment, and Section 11 of the Guidelines)

## 9.1 Required Personal Protective Equipment

PPE must be worn by employees when actual or potential hazards exist and engineering controls or administrative practices cannot adequately control those hazards.

A PPE assessment has been conducted by the RHSM based on project tasks (see PPE specifications below). Verification and certification of assigned PPE by task is completed by the RHSM that approved this plan. Refer to the Guidelines, Section 11, "Personal Protective Equipment," for requirements on the use, care, and maintenance of PPE.

The table below outlines PPE to be used according to task based on project-specific hazard assessment. If a task other than the tasks described in this table needs to be performed, contact the RHSM so this table can be updated.

Project-Specific Personal Protective Equipment Requirements <sup>a</sup>				
Task	Level	Body	Head	Respirator <sup>b</sup>
-General Site Entry -Site Prep/Restoration -Surveying/DGM Mapping -MEC Investigation -Oversight of subcontractors (if outside the exclusion zone)	D	<input checked="" type="checkbox"/> Work clothes (sleeved shirt, long pants) <input type="checkbox"/> Cotton Coveralls <input checked="" type="checkbox"/> Safety-toed Boots <sup>e</sup> <input checked="" type="checkbox"/> Gloves (leather) <input checked="" type="checkbox"/> ANSI/ISEA 107-2010 high visibility vest <input type="checkbox"/> Other: (specify)	<input checked="" type="checkbox"/> ANSI Z89.1 Hardhat <sup>c</sup> <input checked="" type="checkbox"/> ANSI Z87.1 Safety glasses <input checked="" type="checkbox"/> Hearing protection <sup>d</sup>	None required
-IDW Management -Soil Sampling -Excavation/Heavy Equipment Operations	Modified D	<input checked="" type="checkbox"/> Work clothes <input type="checkbox"/> Cotton coveralls <input checked="" type="checkbox"/> ANSI/ISEA 107-2010 high visibility vest <input checked="" type="checkbox"/> Safety-toed boots <input type="checkbox"/> Safety-toed rubber boots (can be decontaminated in a boot wash) <input checked="" type="checkbox"/> Gloves (leather) <input checked="" type="checkbox"/> Inner surgical-style nitrile <input type="checkbox"/> Outer chemical-resistant nitrile gloves. <input checked="" type="checkbox"/> Other: (specify): SC to determine body protection based on potential contact with site contaminants. If outer layer of personal clothing cannot be kept clean, then outer cotton coveralls or uncoated Tyvek coveralls shall be worn. (Polycoated Tyvek when there is potential to contact contaminated groundwater or free liquids from drums.)	<input checked="" type="checkbox"/> ANSI Z89.1 Hardhat <sup>c</sup> <input checked="" type="checkbox"/> ANSI Z87.1 Safety glasses <input checked="" type="checkbox"/> Hearing protection <sup>d</sup>	None required

Project-Specific Personal Protective Equipment Requirements <sup>a</sup>				
Task	Level	Body	Head	Respirator <sup>b</sup>
Equipment decontamination if using pressure washer	Modified D with splash protection	<input checked="" type="checkbox"/> Polycoated Tyvek <input type="checkbox"/> Rain Suit <input type="checkbox"/> ANSI/ISEA 107-2010 high visibility vest <input type="checkbox"/> Safety-toed boots <input checked="" type="checkbox"/> Safety-toed rubber boots (can be deconned in a boot wash) <sup>g</sup> <input type="checkbox"/> Outer boot covers <input checked="" type="checkbox"/> Inner surgical-style nitrile <input checked="" type="checkbox"/> Outer chemical-resistant nitrile gloves. <input type="checkbox"/> Other: (specify)	<input checked="" type="checkbox"/> ANSI Z89.1 Hardhat <sup>c</sup> <input checked="" type="checkbox"/> ANSI Z87.1 Safety glasses <input checked="" type="checkbox"/> Hearing protection <sup>d</sup> <input checked="" type="checkbox"/> Face shield <input checked="" type="checkbox"/> Chemical goggles	None required.
When action levels above are exceeded Or Building Surveys when sampling Asbestos or potential exposure to Lead above the action level	C	<input type="checkbox"/> Uncoated Tyvek <input checked="" type="checkbox"/> Polycoated Tyvek <input type="checkbox"/> ANSI/ISEA 107-2010 high visibility vest <input checked="" type="checkbox"/> Safety-toed boots <sup>g</sup> <input checked="" type="checkbox"/> Safety-toed rubber boots (can be deconned in a boot wash) <input checked="" type="checkbox"/> Outer boot covers <input checked="" type="checkbox"/> Inner surgical-style nitrile <input checked="" type="checkbox"/> Outer chemical-resistant nitrile gloves. <input type="checkbox"/> Other: (specify)	<input type="checkbox"/> ANSI Z89.1 Hardhat <sup>c</sup> <input type="checkbox"/> ANSI Z87.1 Safety glasses <input type="checkbox"/> Hearing protection <sup>d</sup>	<input checked="" type="checkbox"/> Full-face MSA Ultratwin or equivalent air-purifying respirator <input checked="" type="checkbox"/> Cartridges <sup>e</sup> : <u>GME</u>

## Reasons for Upgrading or Downgrading Level of Protection (with approval of the RHSM)

Upgrade <sup>f</sup>	Downgrade
<ul style="list-style-type: none"> <li>Request from individual performing tasks.</li> <li>Change in work tasks that will increase contact or potential contact with hazardous materials.</li> <li>Occurrence or likely occurrence of gas or vapor emission.</li> <li>Known or suspected presence of dermal hazards.</li> <li>Instrument action levels in the "Site Monitoring" section exceeded.</li> </ul>	<ul style="list-style-type: none"> <li>New information indicating that situation is less hazardous than originally thought.</li> <li>Change in site conditions that decrease the hazard.</li> <li>Change in work task that will reduce contact with hazardous materials.</li> </ul>

<sup>a</sup> Modifications are as indicated. CH2M HILL will provide PPE only to CH2M HILL employees.

<sup>b</sup> No facial hair that would interfere with respirator fit is permitted.

<sup>c</sup> Hardhat and splash-shield areas are to be determined by the SC.

<sup>d</sup> Ear protection should be worn when conversations cannot be held at distances of 3 feet (1 meter) or less without shouting.

<sup>e</sup> See cartridge change-out schedule.

<sup>f</sup> Performing a task that requires an upgrade to a higher level of protection (e.g., Level D to Level C) is permitted only when the PPE requirements have been approved by the RHSM, and an SC qualified at that level is present.

<sup>g</sup> Only if tow crushing hazard exist.



## SECTION 10

# Worker Training and Qualification

## 10.1 CH2M HILL Worker Training

(Reference CH2M HILL SOP HSE-110, Training, and Section 12 of the Guidelines)

The following training is required for CH2M HILL personnel working onsite. Copies of training will either be available onsite, or readily available from the CH2M HILL Hands training database system. Refer to Section 12 of the Guidelines for a description of HAZWOPER-related and Safety Coordinator training.

Required CH2M HILL Worker Training	CH2M HILL Task or Equipment-Specific Training (if performing task)
<input checked="" type="checkbox"/> 40-hour HAZWOPER Training	<input type="checkbox"/> Aerial Lift Operator Training
<input checked="" type="checkbox"/> 8-hour HAZWOPER Refresher	<input type="checkbox"/> Confined Space Entry Training
<input checked="" type="checkbox"/> 3-day HAZWOPER OJT	<input checked="" type="checkbox"/> Excavation Safety Training
<input checked="" type="checkbox"/> CH2M HILL HSP Training	<input type="checkbox"/> Fall Protection (site-specific)
<input checked="" type="checkbox"/> CH2M HILL ESBG HSSE Guidelines	<input type="checkbox"/> Forklift Operator
<input checked="" type="checkbox"/> CH2M HILL AHAs	<input checked="" type="checkbox"/> Hazard Communication
<input checked="" type="checkbox"/> Subcontractor HSP/AHAs	<input type="checkbox"/> On-Track Railroad Safety Training
<input type="checkbox"/> 10-hour OSHA Construction Safety Training	<input type="checkbox"/> NFPA 70E Training (energized electrical safety training)
<input checked="" type="checkbox"/> At least one SC-HW ( <a href="#">refer to worker category for all applicable training needed</a> )	<input type="checkbox"/> Qualified Earthmoving Equipment Operator
<input checked="" type="checkbox"/> HWW ( <a href="#">refer to worker category for all applicable training needed</a> )	<input type="checkbox"/> Scaffold Training
<input type="checkbox"/> At least one SC-C ( <a href="#">refer to worker category for all applicable training needed</a> )	<input type="checkbox"/> Other (specify):
<input type="checkbox"/> Other (specify)	<input type="checkbox"/> Other (specify):
<b>Project-Specific Required (VO) Training</b>	
<input checked="" type="checkbox"/> 3R Munitions Safety Awareness Training	<input checked="" type="checkbox"/> Hand Safety Training
<input type="checkbox"/> Arsenic Training	<input type="checkbox"/> Lead Exposure Training
<input type="checkbox"/> Asbestos Awareness Training	<input type="checkbox"/> Lockout/Tagout Training
<input type="checkbox"/> Bear Awareness Training	<input checked="" type="checkbox"/> Manual Lifting Training
<input type="checkbox"/> Benzene Training	<input type="checkbox"/> Methylene Chloride Training
<input type="checkbox"/> Cadmium Training	<input checked="" type="checkbox"/> Noise Training
<input type="checkbox"/> Drum Handling Training	<input type="checkbox"/> Respirators Level C Training
<input type="checkbox"/> Electrical Safety Training	<input type="checkbox"/> Stairways and Ladders
<input checked="" type="checkbox"/> Excavation Safety Training	<input checked="" type="checkbox"/> Traffic Safety Training
<input type="checkbox"/> Fall Protection Training	<input type="checkbox"/> Vinyl Chloride Training
<input type="checkbox"/> Drum Handling Training	

## 10.2 Subcontractor Worker Training

The following training is required for Subcontractor personnel working onsite. Copies of training shall be available onsite.

Required Subcontractor Worker Training	Subcontractor Task or Equipment-Specific Training (required if performing this work)
<input checked="" type="checkbox"/> 40-hour HAZWOPER Training	<input type="checkbox"/> Aerial Lift Operator Training
<input checked="" type="checkbox"/> 8-hour HAZWOPER Refresher	<input type="checkbox"/> Asbestos Competent Person
<input checked="" type="checkbox"/> 8-hour HAZWOPER Supervisor	<input type="checkbox"/> Asbestos Training (Supervisor, Worker)
<input checked="" type="checkbox"/> 3-day HAZWOPER OJT	<input type="checkbox"/> Confined Space Entry Training
<input checked="" type="checkbox"/> CH2M HILL HSP Training	<input type="checkbox"/> Certified Crane Operator
<input checked="" type="checkbox"/> Subcontractor AHAs	<input type="checkbox"/> Crane Assembly/Disassembly Competent Person
<input type="checkbox"/> Subcontractor HSP	<input checked="" type="checkbox"/> Demolition Competent Person
<input type="checkbox"/> 10-hour OSHA Construction Safety Training	<input checked="" type="checkbox"/> Excavation Competent Person
<input type="checkbox"/> 30-hour OSHA Construction Safety Training	<input type="checkbox"/> Fall Protection (site-specific)
<input type="checkbox"/> Respiratory Protection Training	<input type="checkbox"/> Flagger Training
<input checked="" type="checkbox"/> CH2M HILL ESBG HSSE Guidelines	<input type="checkbox"/> Forklift Operator
<input checked="" type="checkbox"/> First Aid/CPR/BBP – at least 2 people	<input checked="" type="checkbox"/> Hazard Communication
<input checked="" type="checkbox"/> Graduate of UXO/EOD school (only applies to UXO Technicians)	<input type="checkbox"/> Ladder Safety Training
	<input type="checkbox"/> Lead Training
	<input type="checkbox"/> Lockout/Tagout Training
	<input type="checkbox"/> On-Track Railroad Safety Training
	<input type="checkbox"/> NFPA 70E Training (energized electrical safety training)
	<input type="checkbox"/> Qualified Drill Rig Operator
	<input checked="" type="checkbox"/> Qualified Earthmoving Equipment Operator
	<input type="checkbox"/> Qualified Rigger
	<input type="checkbox"/> Qualified Crane Signaler
	<input type="checkbox"/> Scaffold Training
	<input type="checkbox"/> Other (specify):

The designation of **competent person** is a specific position of authority for a particular activity with defined roles and responsibilities and, in some cases, requisite qualifications. The Subcontractor must designate a qualified competent person for the following tasks, and supporting documentation (e.g. training documentation, resume of experience, activity competent person designation is granted for, etc.) must be available for CH2M HILL review upon request.

**Subcontractor Tasks Requiring a Competent Person**

<input checked="" type="checkbox"/> Excavation Competent Person	<input type="checkbox"/> Lead Competent Person
<input type="checkbox"/> Asbestos Competent Person	<input checked="" type="checkbox"/> Other: Demolition
<input type="checkbox"/> Scaffolding Competent Person	<input checked="" type="checkbox"/> Other: Geophysical Instrument Competent Letter (NOSSAINST 8020.15D)
<input type="checkbox"/> Crane Competent Person	<input type="checkbox"/> Other:

## 10.3 HAZWOPER-Exempted Tasks

The following tasks are not within the scope of the HAZWOPER standard so HAZWOPER training is not required for workers performing these tasks:

Task	Task
Site Visits	
Site Surveyor (MEC and Anomaly Avoidance Procedures)	

## SECTION 11

# Medical Surveillance and Qualification

---

*(Reference CH2M HILL SOP HSE-113, Medical Surveillance, and Section 13 of the Guidelines)*

The following medical surveillance is required for CH2M HILL and subcontractor personnel working onsite. Copies of physician's medical opinion will either be available onsite, or for CH2M HILL staff, readily available from the CH2M HILL HandS training database system. Refer to Section 13 of the Guidelines for a description of HAZWOPER, respirator user, and hearing conservation medical surveillance.

General Required Medical Surveillance	Job or Activity-Specific Medical Surveillance (required if performing this work)
<input checked="" type="checkbox"/> HAZWOPER Medical Clearance	<input type="checkbox"/> Noise
	<input type="checkbox"/> Baseline Blood Lead
	<input type="checkbox"/> Asbestos Medical Clearance
	<input type="checkbox"/> Other (specify):
<hr/>	
<b>Personnel or Tasks Not Requiring Medical Surveillance</b>	
<hr/>	
Site Visits	
<hr/>	

## SECTION 12

# Site-Control Plan

(Reference CH2M HILL SOP HSE-218, Hazardous Waste Operations, and Section 14 of the Guidelines)

Site control is established to prevent the spread of contamination throughout the site and to ensure that only authorized individuals are permitted into potentially hazardous areas. Task-specific control measures are listed below. **Use of the Buddy System will be implemented unless a Working Alone protocol has been established and approved as indicated in Sections 5 and 6 above.**

Site Control for General Work Area(s)			
<input type="checkbox"/> Perimeter fencing	Location:	<input checked="" type="checkbox"/> Barricades	Location: At the edge of ESQD EZs
<input checked="" type="checkbox"/> Signage	Location: At the edge of ESQD EZs	<input type="checkbox"/> Other: _____	Location:
<input checked="" type="checkbox"/> Traffic control devices	Location: At the edge of ESQD EZs	<input type="checkbox"/> Other: _____	Location:

Location	Site Control Procedure (discuss important elements such as signs, barricades, briefings, qualifications, required supplies and equipment, sign-in/out logs, etc.)
Support Zone	N/A
Contamination Reduction Zone	N/A
Exclusion Zone	If non-essential personnel enter the EZ work will temporary shutdown till non-essential personnel exit EZ.

**SECTION 13**

# Communications

---

A primary and backup means of communication for field crews have been established as described below:

Type of Communication	Primary Means	Backup Means
Communication between field crew	<input checked="" type="checkbox"/> Voice <input type="checkbox"/> Radio <input checked="" type="checkbox"/> Phone	<input type="checkbox"/> Voice <input checked="" type="checkbox"/> Radio <input type="checkbox"/> Phone
Communication with Office crew	<input type="checkbox"/> Radio <input checked="" type="checkbox"/> Phone	<input type="checkbox"/> Radio <input type="checkbox"/> Phone
Communication with Fire and Emergency Services	<input type="checkbox"/> Radio <input checked="" type="checkbox"/> Phone	<input checked="" type="checkbox"/> Radio <input type="checkbox"/> Phone

**SECTION 14**

# Required Facilities and Equipment

---

The following facilities and equipment are required and used for safe completion of work:

Facility	Type	Location
<input checked="" type="checkbox"/> Restrooms	Mobile toilet	Onsite
<input type="checkbox"/> Supplementary Illumination		
<input checked="" type="checkbox"/> Emergency Eyewash	1L eyewash kits	Onsite (truck)
<input type="checkbox"/> Emergency Shower		
<input checked="" type="checkbox"/> First aid kit/supplies	Full first aid kit and trauma kit	Onsite (truck/field)
<input checked="" type="checkbox"/> Fire extinguishers	5lb type ABC	Onsite (truck)
<input checked="" type="checkbox"/> Spill Kit(s)	Large enough to contain all transferred fuel	Onsite (truck)
<input checked="" type="checkbox"/> Potable Water	Plastic disposal bottles	Onsite (truck)
<input type="checkbox"/> Shade/rest area	Truck	Onsite
<input type="checkbox"/> Heated rest area		
<input type="checkbox"/> Other _____		

---

## SECTION 15

# Emergency Response Plan

*(Reference CH2M HILL SOP HSE-106, Emergency Planning, and Section 16 of the Guidelines)*

Personnel responsible for coordinating emergency situations during site activity are identified below. The Emergency Contacts Page is at the front of this Plan. A site map showing assembly points and directions to the authorized medical facility is attached. Documented rehearsal and critique of this plan is required at least once during the task, or more often as necessary.

Responsibility	Name	Phone Number(s)
Emergency Response Coordinator (ERC)	Jake Crostic	864-380-7264
Alternate ERC	UXOSO	TBD
Type field and frequency of rehearsal	Once a week rehearsal conducted by ERC or Alternate ERC	

If an emergency situation develops which requires evacuation of the work area, the following steps shall be implemented.

Evacuation Step	Methods and comments:
Notify affected workers	
Evacuate to safe location	
Assemble and account for workers	
Notify Supervisor/Manager	Notify PM and HSM
Complete incident report	PM and SSC to develop HITS report

**Potential emergency situations and response actions are identified below.**

In case of:	Response actions:
Injury or illness	Notify supervisor, supervisor to notify SSC, SSC to notify PM and HSM
Chemical exposure	Notify supervisor, supervisor to notify SSC, SSC to notify PM and HSM
Fire or explosion	Notify supervisor, supervisor to notify SSC, SSC to notify PM, HSM, and MR QC/H&S
Adverse weather	Notify supervisor, supervisor to notify SSC, SSC to notify PM (if Hurricane notify HSM and Activity Manager)
Heat Stroke	Call 911, have a designee give location and directions to ambulance service if needed. If CH2M HILL employee, call occupational physician at 1-866-893-2514.
Material spill or release	Notify supervisor, supervisor to notify SSC, SSC to notify PM, HSM, and EM



Evacuation Signals:	Meaning:
Grasping throat with hand	Emergency-help me.
Thumbs up	OK; understood.
Grasping buddy's wrist	Leave area now.
Continuous sounding of horn	Emergency; leave site now.

In the event of a **large quantity spill** notify emergency services. Personnel discovering a spill shall (only if safe to do so):

- Stop or contain the spill immediately (if possible) or note source. Shut off the source (e.g., pump, treatment system) if possible. If unsafe conditions exist, then leave the area, call emergency services, inform nearby personnel, notify the site supervisors, and initiate incident reporting process. The SC shall be notified immediately;
- Extinguish sources of ignition (flames, sparks, hot surfaces, cigarettes);
- Clear personnel from the spill location and barricade the area;
- Use available spill control equipment in an effort to ensure that fires, explosions, and releases do not occur, recur, or spread;
- Use sorbent materials to control the spill at the source;
- Construct a temporary containment dike of sorbent materials, cinder blocks, bricks or other suitable materials to help contain the spill;
- Attempt to identify the character, exact source, amount, and extent of the released materials. Identification of the spilled material should be made as soon as possible so that the appropriate cleanup procedure can be identified;
- Contact the RHSM and Project EM in the event of a spill or release immediately so evaluation of reportable quantity requirements and whether agency reporting is required;
- Assess possible hazards to human health or the environment as a result of the release, fire or explosion; and
- Follow incident notification, reporting, and investigation section of this plan.

## Incident Notification, Reporting, and Investigation

---

*(Reference Section 16 of the Guidelines for complete definitions and protocol)*

### 16.1 Incident Notification

All employees and subcontractors' employees shall immediately report any incident (including "near misses,") in which they are involved or witness to their supervisor.

The CH2M HILL or Subcontractor supervisor, upon receiving an incident report, shall inform his immediate superior and the CH2M HILL SC.

The SC shall immediately report the following information to the RHSM and PM by phone and e-mail:

- Project Name and Site Manager;
- Date and time of incident;
- Description of incident;
- Extent of known injuries or damage;
- Level of medical attention; and
- Preliminary root cause/corrective actions

**If the incident was an environmental permit issue (potential permit non-compliance, other situation that result in a notice of violation) or a spill or release, contact the Project EM immediately so evaluation of reportable quantity requirements and whether agency reporting is required.**

### 16.2 Drug and Alcohol Testing for CH2M HILL Employees

As required by CH2M HILL Policy 810, U.S. Employees are subject to post-incident and reasonable suspicion drug and alcohol testing. The Employee must submit to drug and alcohol testing if the supervisor has a reasonable suspicion, and when any of the following occur:

- Work-related injury in which the Company reasonably believes (under the Reasonable Suspicion provisions in the Policy) that drug and/or alcohol use is a contributing factor;
- Incident resulting in property damage over USD\$500 as determined by the Company;
- Injury on or in Company Property/Workplace (to Employee or third parties) involving the Employee's use of heavy machinery as determined by the Company;
- Incident considered to be a serious near-miss injury that occurs in the field or in the office as determined by the Company and where the Company reasonably believes (under the Reasonable Suspicion provisions in the Policy) that drug and/or alcohol use is a contributing factor to the serious near miss injury;
- Other circumstances as dictated by Employee Relations; or
- An Employee contributes to any of the above.

Refer to the ESBG HSSE Guidelines and CH2M HILL Policy 810 for additional information and specific requirements.

### 16.3 Drug and Alcohol Testing for Subcontractors

The drug and alcohol testing requirements stated above apply to subcontractors when required by the subcontract.

## 16.4 HITS System and Incident Report Form

The SC shall complete an entry into the Hours and Incident Tracking System (HITS) database system located on CH2M HILL's Virtual Office (or if VO not available, use the hard copy Incident Report Form and Root Cause Analysis Form and forward it to the RHSM) within 24 hours and finalize those forms within 3 calendar days.

## 16.5 Injury Management/Return-to-Work (for US/Puerto Rico based CH2M HILL Staff Only)

In the event of an injury, the following actions shall be taken:

- Employee informs their supervisor.
- Employee calls the Injury Management Program toll free number 1-866-893-2514 immediately and speaks with the Occupational Injury Nurse. This number is operable 24 hours per day, 7 days a week. **Employees are encouraged to enter this phone number into their cell phones prior to starting field work.**
- Supervisor ensures employee immediately calls the Injury Management Program number. Supervisor makes the call with the injured worker or for the injured worker, if needed.
- Nurse assists employee with obtaining appropriate medical treatment, as necessary schedules clinic visit for employee (calls ahead, and assists with any necessary follow up treatment). The supervisor or SC accompanies the employee if a clinic visit is necessary to ensure that employees receive appropriate and timely care.
- Supervisor or SC completes the HITS entry or Incident Report Form immediately (within 24 hours) and forwards it to the Project Manager and RHSM.
- Nurse notifies appropriate CH2M HILL staff by e-mail (supervisor, Health & Safety, Human Resources, Workers' Compensation).
- Nurse communicates and coordinates with and for employee on treatment through recovery.
- Supervisor ensures suitable duties are identified and available for injured or ill workers who are determined to be medically fit to return to work on transitional duty (temporary and progressive).
- Supervisor ensures medical limitations prescribed (if any) by physician are followed until the worker is released to full duty.

## 16.6 Serious Incident Reporting Requirements

Serious incidents include the following:

- Work related death, or life threatening injury or illness of a CH2M HILL employee, subcontractor, or member of the public;
- Kidnap or missing person;
- Acts or threats of terrorism;
- Event that involves a fire, explosion, or property damage that requires a site evacuation or is estimated to result in greater than \$ 500,000 in damage; or
- Spill or release of hazardous materials or substances that involves a significant threat of imminent harm to site workers, neighboring facilities, the community or the environment.

***If an incident meets the "Serious Incident" criteria, the Project Manager is to immediately contact the Crisis Manager at 720-286-4911, then follow the standard incident reporting procedure.***

# Inspections

---

## 17.1 Project Activity Self-Assessment Checklists

The following self-assessment checklists are required when the task or exposure is initiated and weekly thereafter. The checklists shall be completed by the SC or other CH2M HILL representative and maintained in project files. The checklist are provided in **Attachment D**.

---

Hand and Power Tools

Excavation

Demolition

Hazardous Materials Handling

PPE

---

## 17.2 Safe Behavior Observations

The SC or designee shall perform at least one SBO each week for any field work performed by subcontractors or when there are at least two CH2M HILL personnel performing field work.

E-mail completed forms to:

- Federal Sector: [CH2M HILL ES FED Safe Behavior Observation](#)

## SECTION 18

# Records and Reports

---

Refer to the Guidelines, Section 19, “Records and Reports,” for a complete description of HSE recordkeeping requirements. Below are examples of records that must be maintained as the project progresses:

- Exposure records includes air monitoring data (including calibration records), SDSs, exposure modeling results
- Training records
- Respiratory fit test records
- Incident reports, investigations and associated back-up information
- Federal or state agency inspection records
- HSE audits and assessments
- Confined space entry permits
- Equipment inspections
- Equipment maintenance
- Emergency equipment inspection records
- SBOs
- Self-assessment checklists
- Daily Safety Meeting Sign-In forms/PTSPs

# Employee Signoff Form

## EMPLOYEE SIGNOFF FORM

### Health and Safety Plan

The CH2M HILL project employees and subcontractors listed below have been provided with a copy of this HSP, have read and understood it, and agree to abide by its provisions.

**Project Name:** MRI of MCAS New River– MCAS New  
River-Runway Expansion Area

**Project Number:** 476480

<b>EMPLOYEE NAME</b> (Please print)	<b>EMPLOYEE SIGNATURE</b>	<b>COMPANY</b>	<b>DATE</b>

**Attachment A**  
**ESBG HSSE Guidelines**

---

# **ESBG Health, Safety, Security, and Environment Guidelines**

## **Marine Corps Installations East - Marine Corps Base Camp Lejeune North Carolina**

**Contract Task Order WE5A**

**August 2013**

Prepared for

**Department of the Navy  
Naval Facilities Engineering Command  
Mid-Atlantic**

Under the

**NAVFAC CLEAN Program  
Contract N62470-08-D-8012**

Prepared by





# Contents

---

<b>1</b>	<b>Introduction.....</b>	<b>1-1</b>
1.1	CH2M HILL Policy and Commitment.....	1-1
1.1.1	Safe Work Policy .....	1-1
1.1.2	Health and Safety Commitment .....	1-1
1.1.3	Project-Specific Health, Safety, and the Environment Goals .....	1-1
<b>2</b>	<b>Applicability.....</b>	<b>2-1</b>
<b>3</b>	<b>Roles and Responsibilities .....</b>	<b>3-1</b>
3.1	CH2M HILL Project Manager.....	3-1
3.2	CH2M HILL Responsible Health and Safety Manager .....	3-2
3.3	CH2M HILL Project Environmental Manager .....	3-2
3.4	CH2M HILL Safety Coordinator .....	3-2
3.5	CH2M HILL Employees .....	3-3
3.5.1	Employee Authority.....	3-4
3.6	CH2M HILL Subcontractors.....	3-4
3.7	Client Contractors.....	3-5
<b>4</b>	<b>Standards of Conduct .....</b>	<b>4-1</b>
4.1	Standards of Conduct Violations .....	4-1
4.2	Disciplinary Actions.....	4-1
4.3	Subcontractor Safety Performance .....	4-1
4.3.1	Observed Hazard Form.....	4-1
4.3.2	Stop Work Order.....	4-2
4.4	Incentive Program .....	4-2
4.5	Reporting Unsafe Conditions/Practices.....	4-2
<b>5</b>	<b>Safety Planning and Change Management .....</b>	<b>5-1</b>
5.1	Daily Safety Meetings and Pre-Task Safety Plans.....	5-1
5.2	Change Management .....	5-1
5.3	Agency Inspection Guidance .....	5-1
<b>6</b>	<b>Project Hazard Analysis .....</b>	<b>6-1</b>
6.1	Activity Hazard Analysis.....	6-1
6.2	Subcontractor Activity Hazard Analysis .....	6-1
<b>7</b>	<b>General Hazards and Controls.....</b>	<b>7-1</b>
7.1	Bloodborne Pathogens .....	7-1
7.2	Chemical Storage .....	7-1
7.2.1	Storage of Flammable/Combustible Liquids .....	7-1
7.2.2	Indoor Storage of Flammable/Combustible Liquids.....	7-2
7.2.3	Outside Storage of Flammable/Combustible Liquids .....	7-2
7.2.4	Storage of Hazardous Waste .....	7-2
7.2.5	Storage of Chemical Injection Chemicals/Materials.....	7-2
7.3	Driving Safety.....	7-3
7.4	Electrical Safety.....	7-4
7.5	Field Ergonomics and Manual Lifting.....	7-4
7.6	Field Trailer/Office Setup and Maintenance .....	7-6
7.7	Field Vehicles .....	7-7
7.8	Fire Prevention .....	7-7

7.8.1	Fire Extinguishers and General Fire Prevention Practices .....	7-8
7.8.2	Dispensing of Flammable/Combustible Liquids .....	7-8
7.9	General Practices and Housekeeping .....	7-8
7.10	Hazard Communication .....	7-9
7.11	Knife Use .....	7-10
7.12	Lighting .....	7-11
7.13	Manual Lifting .....	7-11
7.14	Personal Hygiene .....	7-11
7.15	Personal Security .....	7-11
7.16	Shipping and Transportation of Hazardous Materials .....	7-14
7.17	Substance Abuse .....	7-14
7.18	Unknown or Suspect Objects/Materials .....	7-15
<b>8</b>	<b>Project-Specific Hazard Controls .....</b>	<b>8-1</b>
8.1	Abrasive Blasting .....	8-1
8.2	Aerial Lifts .....	8-1
8.3	All-Terrain Vehicles and Utility-Type Vehicle Safety .....	8-2
8.4	Arsenic .....	8-3
8.5	Asbestos .....	8-4
8.6	Benzene .....	8-5
8.7	Cadmium .....	8-5
8.8	Chainsaws .....	8-6
8.8.1	Equipment .....	8-6
8.8.2	PPE Requirements .....	8-6
8.8.3	Safe Operation .....	8-7
8.8.4	Refueling the Engine .....	8-7
8.9	Chemical Injections .....	8-7
8.10	Compressed Gas Cylinders .....	8-9
8.11	Concrete Work and Masonry Construction Activities (Including well pad construction) .....	8-10
8.12	Concrete Core Drilling .....	8-11
8.13	Concrete Saw Cutting .....	8-12
8.14	Confined Space Entry Activities .....	8-12
8.15	Cranes .....	8-13
8.16	Crystalline Silica .....	8-16
8.17	Demolition .....	8-16
8.18	Drilling Safety .....	8-17
8.19	Drum and Portable Tank Handling .....	8-18
8.20	Drum Sampling Safety .....	8-19
8.21	Earthmoving Equipment .....	8-20
8.22	Energized Electrical Work .....	8-21
8.23	Excavation Activities .....	8-22
8.24	Fall Protection Activities .....	8-23
8.25	Flight Line Safety .....	8-24
8.26	Forklift Operations .....	8-25
8.27	Groundwater Sampling/Water Level Measurements .....	8-25
8.28	Hand and Power Tools .....	8-26
8.29	Haul Trucks .....	8-28
8.30	Hoists .....	8-28
8.31	Hydrogen Sulfide .....	8-29
8.32	Lead .....	8-30
8.33	Lockout/Tagout Activities .....	8-31

8.34	Avoidance of Munitions and Explosives of Concern (MEC) and/or Materials Potentially Posing an Explosives Hazard (MPPEH) .....	8-31
8.35	Marijuana Cultivation Sites.....	8-32
8.36	Methane (as a Product of Injection Activities) .....	8-33
8.37	Methane (as Landfill Gas or Shale Formations).....	8-33
8.38	Methylene Chloride .....	8-34
8.39	Naturally Occurring Radiation Materials (NORM) .....	8-35
8.40	PCB/Ballast Handling .....	8-36
8.41	Portable Generator Hazards .....	8-37
8.42	Powder-Actuated Tools .....	8-37
8.43	Pressure Line/Vessel Systems.....	8-38
8.44	Pressure Washing Operations .....	8-38
8.45	Process Safety Management .....	8-39
8.46	Radar Hazards.....	8-39
8.47	Rail Road Safety .....	8-40
8.48	Rigging .....	8-41
	8.48.1 General .....	8-41
	8.48.2 Equipment .....	8-41
	8.48.3 Rigging Use .....	8-42
8.49	Scaffolds.....	8-42
	8.49.1 Working from Scaffolds .....	8-42
	8.49.2 Supported Scaffolds.....	8-43
	8.49.3 Suspended Scaffolding.....	8-44
	8.49.4 Fall Protection on Suspended Scaffolds .....	8-44
8.50	Stairways and Ladders .....	8-45
8.51	Steel Erection.....	8-46
8.52	Slips, Trips and Falls .....	8-46
8.53	Stream Crossing.....	8-47
8.54	Traffic Control .....	8-48
8.55	Utilities (underground) .....	8-49
8.56	Utilities (overhead) .....	8-51
8.57	Vacuum Trucks.....	8-52
8.58	Vinyl Chloride.....	8-52
8.59	Welding and Cutting .....	8-53
	8.59.1 Compressed Gas Cylinders .....	8-54
	8.59.2 Welding and Cutting Equipment .....	8-54
	8.59.3 Arc Welding and Cutting.....	8-55
	8.59.4 Toxic Fumes and Gases.....	8-55
	8.59.5 Fire Prevention .....	8-55
8.60	Working Around Material Handling Equipment.....	8-56
8.61	Working Alone .....	8-56
8.62	Working Over Water.....	8-58
<b>9</b>	<b>Physical Hazards and Controls .....</b>	<b>9-1</b>
9.1	Noise .....	9-1
9.2	Ultraviolet Radiation (sun exposure).....	9-1
9.3	Temperature Extremes.....	9-2
	9.3.1 Heat .....	9-3
	9.3.2 Cold.....	9-8
<b>10</b>	<b>Biological Hazards and Controls.....</b>	<b>10-1</b>
10.1	Black Bears.....	10-1

10.2	Bees and Other Stinging Insects .....	10-1
10.3	Bird Droppings .....	10-2
10.4	Cactus .....	10-2
10.5	Cougars/Mountain Lions .....	10-2
10.6	Coyotes .....	10-3
10.7	Feral Dogs .....	10-3
10.8	Feral Pigs.....	10-3
10.9	Fire Ants.....	10-3
10.10	Hantavirus.....	10-4
10.11	Hazards during Hunting Seasons .....	10-4
10.12	Leeches .....	10-5
10.13	Mosquito Bites.....	10-6
10.14	Poison Ivy, Poison Oak, and Poison Sumac.....	10-6
10.15	Scorpions .....	10-8
10.16	Snakes.....	10-8
10.17	Spiders - Brown Recluse and Widow .....	10-9
10.18	Ticks .....	10-10
<b>11</b>	<b>Personal Protective Equipment.....</b>	<b>11-1</b>
11.1	Required Personal Protective Equipment .....	11-1
11.2	Respiratory Protection.....	11-1
<b>12</b>	<b>Worker Training and Qualification .....</b>	<b>12-1</b>
12.1	CH2M HILL Worker Training .....	12-1
12.1.1	Hazardous Waste Operations Training.....	12-1
12.1.2	Competent Person.....	12-1
12.1.3	First Aid/Cardiopulmonary Resuscitation.....	12-2
12.1.4	Safety Coordinator Training.....	12-2
12.1.5	Site-Specific Training .....	12-2
<b>13</b>	<b>Medical Surveillance and Qualification .....</b>	<b>13-1</b>
13.1	Hazardous Waste Operations and Emergency Response.....	13-1
13.2	Respirator User Qualification .....	13-1
13.3	Hearing Conservation .....	13-1
<b>14</b>	<b>Site-Control Plan .....</b>	<b>14-1</b>
14.1	Site-Control Procedures.....	14-1
14.2	Remediation Work Area Zones.....	14-1
14.2.1	Support Zone .....	14-1
14.2.2	Contamination Reduction Zone.....	14-1
14.2.3	Exclusion Zone .....	14-1
14.2.4	Other Controlled Areas.....	14-2
<b>15</b>	<b>Decontamination .....</b>	<b>15-1</b>
15.1	Contamination Prevention .....	15-1
15.2	Personnel and Equipment Decontamination .....	15-1
15.3	Decontamination During Medical Emergencies .....	15-2
15.4	Waste Collection and Disposal .....	15-2
15.5	Diagram of Personnel-Decontamination Line .....	15-2
<b>16</b>	<b>Emergency Preparedness .....</b>	<b>16-1</b>
16.1	Pre-Emergency Planning.....	16-1
16.2	Incident Response.....	16-1

16.3	Emergency Medical Treatment .....	16-2
16.4	Evacuation .....	16-2
16.5	Evacuation Signals .....	16-2
16.6	Inclement Weather .....	16-3
16.6.1	Tornado Safety.....	16-3
<b>17</b>	<b>Inspections .....</b>	<b>17-1</b>
17.1	Management Health, Safety, Security, and Environment Inspections.....	17-1
17.2	Project Activity Self-Assessment Checklists.....	17-1
17.3	Safe Behavior Observations.....	17-1
<b>18</b>	<b>Incident Notification, Reporting, and Investigation .....</b>	<b>18-1</b>
18.1	General Information .....	18-1
18.2	Section Definitions.....	18-1
18.3	Reporting Requirements.....	18-2
18.4	Drug and Alcohol Testing for CH2M HILL Employees .....	18-2
18.5	Drug and Alcohol Testing for Subcontractors.....	18-3
18.6	HITS System and Incident Report Form .....	18-3
18.7	Injury Management/Return-to-Work (for U.S./Puerto Rico based CH2M HILL Staff Only) .....	18-3
18.7.1	Background .....	18-3
18.7.2	The Injury Management/Return-to-Work Notification Process:.....	18-3
18.8	Serious Incident Reporting Requirements.....	18-4
18.8.1	Serious Incident Determination.....	18-4
18.8.2	Serious Incident Reporting .....	18-4
18.9	Incident Root Cause Analysis .....	18-6
18.9.1	Corrective Actions.....	18-6
<b>19</b>	<b>Records and Reports .....</b>	<b>19-1</b>

## Attachments

Employee Sign-Off Form

Subcontractor Sign-Off Form

# Introduction

---

## 1.1 CH2M HILL Policy and Commitment

### 1.1.1 Safe Work Policy

It is the policy of CH2M HILL to perform work in the safest manner possible. Safety must never be compromised. To fulfill the requirements of this policy, an organized and effective safety program must be carried out at each location where work is performed.

CH2M HILL believes that all injuries are preventable, and we are dedicated to the goal of a safe work environment. To achieve this goal, every employee on the project must assume responsibility for safety.

Every employee is empowered to:

- Conduct their work in a safe manner;
- Stop work immediately to correct any unsafe condition that is encountered; and
- Take corrective actions so that work may proceed in a safe manner.

Safety, occupational health, and environmental protection will not be sacrificed for production. These elements are integrated into quality control, cost reduction, and job performance, and are crucial to our success.

### 1.1.2 Health and Safety Commitment

CH2M HILL has embraced a philosophy for health and safety excellence. The primary driving force behind this commitment to health and safety is simple: employees are CH2M HILL's most significant asset and CH2M HILL management values their safety, health, and welfare. Also, top management believes that all injuries are preventable. CH2M HILL's safety culture empowers employees at all levels to accept ownership for safety and take whatever actions are necessary to eliminate injury. Our company is committed to world-class performance in health and safety and also understands that world-class performance in health and safety is a critical element in overall business success.

CH2M HILL is committed to the prevention of personal injuries, occupational illnesses, and damage to equipment and property in all of its operations; to the protection of the general public whenever it comes in contact with the Company's work; and to the prevention of pollution and environmental degradation.

Company management, field supervisors, and employees plan safety into each work task in order to prevent occupational injuries and illnesses. The ultimate success of CH2M HILL's safety program depends on the full cooperation and participation of each employee.

CH2M HILL management extends its full commitment to health and safety excellence.

### 1.1.3 Project-Specific Health, Safety, and the Environment Goals

All management and employees are to strive to meet the project-specific Health, Safety, and the Environment (HSE) goals outlined below. The team will be successful only if everyone makes a concerted effort to accomplish these goals. The goals allow the project to stay focused on optimizing the health and safety of all project personnel and, therefore, making the project a great success.

The Project has established eleven specific goals and objectives:

- Create an injury-free environment;
- Have zero injuries or incidents;
- Provide management leadership for HSE by communicating performance expectations, reviewing and tracking performance, and leading by example;

- Ensure effective implementation of the project safety plan through education, delegation, and team work;
- Ensure 100 percent participation in HSE compliance;
- Continuously improve our safety performance;
- Maintain free and open lines of communication;
- Make a personal commitment to safety as a value;
- Focus safety improvements on high-risk groups;
- Continue strong employee involvement initiatives; and
- Achieve health and safety excellence.

## SECTION 2

# Applicability

---

These Health, Safety, Security, and Environment Guidelines (Guidelines) apply to:

- All CH2M HILL staff, including subcontractors and tiered subcontractors of CH2M HILL working on the site; and
- All visitors to the construction site in the custody of CH2M HILL (including visitors from the Client, the Government, the public, and other staff of any CH2M HILL company).

These Guidelines do not apply to the third-party contractors, their workers, their subcontractors, their visitors, or any other persons not under the direct control or custody of CH2M HILL.

These Guidelines define the procedures and requirements for the health and safety of CH2M HILL staff and visitors when they are physically on the work site. The work site includes the project area (as defined by the contract documents) and the project offices, trailers, and facilities thereon.

These Guidelines will be kept onsite during field activities and will be reviewed as necessary. The Handbook will be amended or revised as project activities or conditions change or when supplemental information becomes available. The Handbook adopts, by reference, the Enterprise-wide Core Standards and Standard Operating Procedures (SOPs), as appropriate. In addition, the Handbook may adopt procedures from the project Work Plan and any governing regulations. If there is a contradiction between these Guidelines and any governing regulation, the more stringent and protective requirement shall apply.

These Guidelines incorporate the regulatory requirements described in the State of California OSHA agency – Cal/OSHA Title 8 CCR, Section 3203, Injury and Illness Prevention Program (IIPP), and section 1509, Construction Injury and Illness Prevention Program. The current version of [CH2M HILL Cal/OSHA IIPP written program](#) can be accessed on the HSSE website under Programs.

All CH2M HILL staff and subcontractors must sign the employee sign-off form included at the end of this document to acknowledge review of this document. Copies of the signature page will be maintained by the SPA or onsite by the Safety Coordinator (SC).



## SECTION 3

# Roles and Responsibilities

---

The sections below describe the roles and responsibilities of personnel referred to in the project-specific safety plan.

## 3.1 CH2M HILL Project Manager

The project manager (PM) is responsible for providing adequate resources (budget and staff) for project-specific implementation of the HSE management process. The PM has overall management responsibility for the tasks listed below. The PM may explicitly delegate specific tasks to other staff, as described in sections that follow, but retains ultimate responsibility for completion of the following in accordance with this document and applicable safety plans:

- Incorporate standard terms and conditions, and contract-specific HSE roles and responsibilities in contract and subcontract agreements (including flow-down requirements to lower-tier subcontractors).
- Select safe and competent subcontractors by:
  - Choosing potential subcontractors based on technical ability and HSE performance;
  - Implementing the subcontractor prequalification process;
  - Ensuring that acceptable certificates of insurance, including CH2M HILL as named additional insured, are secured as a condition of subcontract award; and
  - Ensuring HSE submittals, subcontract agreements, and appropriate site-specific safety procedures are in place and accepted prior field mobilization.
- Ensure copies of training and medical monitoring records, and site-specific safety procedures are being maintained in the project file accessible to site personnel.
- Provide oversight of subcontractor HSE practices per the site-specific safety plans and procedures.
- Manage the site and interfacing with 3<sup>rd</sup> parties in a manner consistent with the contract and subcontract agreements and the applicable standard of reasonable care.
- Ensure that the overall, job-specific, HSE goals are fully and continuously implemented.
- Provide visible support and motivation for HSE programs, rules, procedures, processes, and training, leading by example and encouraging CH2M HILL employees to take ownership of HSE issues.
- Intervene or stop work when an unsafe condition or behavior is observed, and/or when an environmentally compromising condition is encountered.
- Make available to and require CH2M HILL employees to complete required HSE training within established timelines and provide project numbers for such training.
- Consistently and even-handedly enforce HSE rules, procedures, and requirements at the office and/or on project work sites.
- Promptly report all work-related HSE incidents or near misses.
- Wear any required personal protective equipment.
- Ensure CH2M HILL employees complete required HSE training within established timelines.
- Conduct, cooperate, or assist with HSE incident investigations.

- Consult with the Human Resources Delivery Partner before taking any disciplinary action (other than verbal counseling) associated with CH2M HILL Policy 203 and/or HSE programs rules, procedures, processes and training.

## **3.2 CH2M HILL Responsible Health and Safety Manager**

The RHSM is responsible for the following:

- Review and evaluate subcontractor HSE performance using the pre-qualification process;
- Approve HSP and its revisions as well as Activity Hazard Analyses (AHA);
- Review and evaluate subcontractor site-specific safety procedures for adequacy prior to start of subcontractor's field operations;
- Support the oversight (or SC's direct oversight) of subcontractor and tiered subcontractor HSE practices;
- Permit upgrades and downgrades in respiratory protection after reviewing analytical data;
- Conduct audits as determined by project schedule and coordination with PM; and
- Participate in incident investigations, lessons learned, loss and near loss reporting.

## **3.3 CH2M HILL Project Environmental Manager**

The Project EM is responsible for the following:

- Provide environmental program support in areas such as training, auditing, planning, permit tracking, and subcontractor oversight as needed or as specified in the project environmental plan or equivalent plan;
- Review and evaluate qualifications for subcontractors with a history of environmental non-compliance and for waste transportation and disposal subcontractors;
- Evaluate any spills, releases, or environmental permit incidents for appropriate follow-up actions, notifications, and recordkeeping requirements; and
- Provide environmental compliance and environmental management expertise and advice to the project team as needed during the course of the project.

## **3.4 CH2M HILL Safety Coordinator**

The SC is responsible for verifying that the project is conducted in a safe manner including the following specific obligations:

- Verify the project safety plan is current and amended when project activities or conditions change;
- Verify CH2M HILL site personnel and subcontractor personnel read the safety plan and sign the Employee Sign-Off Form, prior to commencing field activities;
- Verify CH2M HILL site personnel have completed any required specialty training (for example, fall protection, confined space entry, among others) and medical surveillance as identified in the project safety plan;
- Verify that project files include copies of subcontractor training and medical monitoring records, and accepted site-specific safety procedures prior to start of subcontractor's field operations;
- Act as the project "Hazard Communication Coordinator" and perform the responsibilities outlined in the project safety plan;
- Act as the project "Emergency Response Coordinator" and perform the responsibilities outlined in the project safety plan;

- Post the Occupational Safety and Health Administration (OSHA) job-site poster; the poster is required at sites where project field offices, trailers, or equipment-storage boxes are established. If you work in a state with an OSHA State Plan, make sure the State Plan poster is posted, if required;
- Hold and/or verify that safety meetings are conducted and documented in the project file initially and as needed throughout the course of the project (as tasks or hazards change);
- Verify that project health and safety forms and permits are being used as outlined in the project safety plan;
- Perform oversight and assessments of subcontractor HSE practices per the site-specific safety plan and verify that project activity self-assessment checklists are being used as outlined in the project safety plan;
- Coordinate with the RHSM regarding CH2M HILL and subcontractor operational performance, and 3<sup>rd</sup> party interfaces;
- Verify appropriate personal protective equipment (PPE) use, availability, and training;
- Ensure that the overall, job-specific, HSE goals are fully and continuously implemented;
- Conduct accident investigations including root cause analysis;
- Calibrate and conduct air monitoring in accordance with the project safety plan; maintain all air monitoring records in project file;
- Maintain HSE records and documentation;
- Facilitate OSHA or other government agency inspections including accompanying inspector and providing all necessary documentation and follow-up;
- Deliver field HSE training as needed based on project-specific hazards and activities;
- Consistently and even-handedly enforce HSE rules, procedures, and requirements at the office and/or on project work sites;
- Wear any required personal protective equipment;
- Conduct, cooperate, or assist with HSE incident investigations;
- Contact the PM and RHSM when standards of conduct or CH2M HILL Policy 203 has been violated by a CH2M HILL employee;
- Contact the RHSM and PM in the event of an incident;
- Contact the RHSM and Project EM in the event of a spill or release immediately so evaluation of reportable quantity requirements and whether agency reporting is required;
- When an apparent imminent danger exists, immediately remove all affected CH2M HILL employees and subcontractors, notify subcontractor safety representative, stop affected work until adequate corrective measures are implemented, and notify the PM and RHSM as appropriate; and
- Document all verbal health and safety-related communications in project field logbook, daily reports, or other records.

## 3.5 CH2M HILL Employees

All personnel are assigned responsibility for safe and healthy operations. This concept is the foundation for involving all employees in identifying hazards and providing solutions. For any operation, individuals have full authority to stop work and initiate immediate corrective action or control. In addition, each worker has a right and responsibility to report unsafe conditions or practices. This right represents a significant facet of worker empowerment and program ownership. Through shared values and a belief that all accidents are preventable, our employees accept personal responsibility for working safely.

Each employee is responsible for the following performance objectives:

- Understanding and abiding by CH2M HILL and client HSE programs, rules, procedures, processes, and training, including any that are project-specific;
- Completing all required HSE training made available and accessible within established timelines;
- Always wearing any required personal protective equipment;
- Intervening or stopping work for you or other CH2M HILL employees when an unsafe condition or behavior is encountered or observed, and/or when an environmentally compromising condition exists;
- Promptly notifying a supervisor, PM, SC, or RHSM when an unsafe condition or behavior is observed, and/or when an environmentally compromising condition exists;
- Promptly reporting a supervisor, PM, SC, or RHSM all work-related health, safety, and environmental incidents or near misses;
- Attending required project HSE pre-task briefings and meeting prior to performing work; and
- Cooperating or assisting with HSE incident investigations.

### **3.5.1 Employee Authority**

Each employee on the project has the obligation and authority to shut down any perceived unsafe work and during employee orientation, each employee will be informed of their authority to do so.

## **3.6 CH2M HILL Subcontractors**

Subcontractors must comply with the following activities, and are responsible to:

- Comply with all local, state, and federal safety standards;
- Comply with project and owner safety requirements;
- Actively participate in the project safety program and either hold or attend and participate in all required safety meetings;
- Provide a qualified safety representative to interface with CH2M HILL;
- Maintain safety equipment and PPE for their employees;
- Maintain and replace safety protection systems damaged or removed by the subcontractor's operations;
- Notify the SC of any accident, injury, or incident (including spills or releases) immediately and submit reports to CH2M HILL within 24 hours;
- Install contractually required general conditions for safety (for example, handrail, fencing, fall protection systems, floor opening covers);
- Conduct and document weekly safety inspections of project-specific tasks and associated work areas;
- Conduct site-specific and job-specific training for all subcontractor employees, including review of the CH2M HILL safety plan, subcontractor safety plans, and subcontractor AHAs and sign appropriate sign-off forms; and
- Determine and implement necessary controls and corrective actions to correct unsafe conditions.

Subcontractors may be required to submit their own site-specific safety plan and other plans such as lead or asbestos abatement compliance plans. Subcontractors are responsible for the health and safety procedures specific to their work, and are required to submit their plans to CH2M HILL for review and acceptance before the start of field work.

Subcontractors are also required to prepare AHAs before beginning each activity posing hazards to their personnel. The AHA shall identify the principle steps of the activity, potential health and safety hazards for each step and recommended control measures for each identified hazard. In addition, a listing of the equipment to be used to perform the activity, inspection requirements, and training requirements for the safe operation of the equipment listed must be identified.

### 3.7 Client Contractors

CH2M HILL project safety plans do not cover contractors that are contracted directly to the client or the owner. CH2M HILL is not responsible for the health and safety or means and methods of the contractor's work, and we must never assume such responsibility through our actions (such as advising on health and safety issues). In addition to these instructions, CH2M HILL team members should review contractor safety plans so that we remain aware of appropriate precautions that apply to us. Self-assessment checklists are to be used by the SC and CH2M HILL team members to review the contractor's performance only as it pertains to evaluating CH2M HILL exposure and safety. The RHSM is the only person who is authorized to comment on or approve contractor safety procedures.

Health and safety-related communications with contractors should be conducted as follows:

- Request the contractor to brief CH2M HILL team members on the precautions related to the contractor's work;
- When an apparent contractor non-compliance or unsafe condition or practice poses a risk to CH2M HILL team members:
  - Notify the contractor safety representative;
  - Request that the contractor determine and implement corrective actions;
  - If necessary, stop affected CH2M HILL work until contractor corrects the condition or practice; and
  - Notify the client, PM, and RHSM as appropriate.

If apparent contractor non-compliance or unsafe conditions or practices are observed, inform the contractor safety representative (CH2M HILL's obligation is limited strictly to informing the contractor of the observation; the contractor is solely responsible for determining and implementing necessary controls and corrective actions).

If an apparent imminent danger is observed, immediately warn the contractor employee(s) in danger and notify the contractor safety representative (CH2M HILL's obligation is limited strictly to immediately warning the affected individual(s) and informing the contractor of the observation; the contractor is solely responsible for determining and implementing necessary controls and corrective actions).

All verbal health and safety-related communications will be documented in project field logbook, daily reports, or other records.

## SECTION 4

# Standards of Conduct

---

All individuals associated with this project must work injury-free and drug-free and must comply with the following standards of conduct, and the safety requirements of CH2M HILL. Commonly accepted standards of conduct help maintain good relationships between people. They promote responsibility and self-development. Misunderstandings, frictions, and disciplinary action can be avoided by refraining from thoughtless or wrongful acts.

## 4.1 Standards of Conduct Violations

All individuals associated with this project are expected to behave in a professional manner. Violations of the standards of conduct would include, but not be limited to:

- Failure to perform work;
- Inefficient performance, incompetence, or neglect of work;
- Willful refusal to perform work as directed (insubordination);
- Negligence in observing safety regulations, poor housekeeping, or failure to report on-the-job injuries or unsafe conditions;
- Unexcused or excessive absence or tardiness;
- Unwillingness or inability to work in harmony with others;
- Discourtesy, irritation, friction, or other conduct that creates disharmony;
- Harassment or discrimination against another individual;
- Failure to be prepared for work by wearing the appropriate construction clothing or bringing the necessary tools; or
- Violation of any other commonly accepted reasonable rule of responsible personal conduct.

## 4.2 Disciplinary Actions

The Environmental Services (ES) business group employees, employees working on ES business group projects, and subcontractor employees are subject to disciplinary action for not following HSE rules and requirements. Potential disciplinary action is equally applicable to all employees including management and supervision. Disciplinary action may include denial of access to the worksite, warnings, reprimands, and other actions up to and including termination depending on the specific circumstances.

## 4.3 Subcontractor Safety Performance

CH2M HILL should continuously endeavor to observe subcontractors' safety performance and adherence to their plans and AHAs. This endeavor should be reasonable, and include observing for hazards or unsafe practices that are both readily observable and occur in common work areas. CH2M HILL oversight does not relieve subcontractors of their responsibility for effective implementation and compliance with the established plan(s).

### 4.3.1 Observed Hazard Form

When apparent non-compliance or unsafe conditions or practices are observed, notify the subcontractor's supervisor or safety representative verbally, and document using the Observed Hazard Form, included as an attachment to the project safety plan, and require corrective action.

If necessary, stop subcontractor's work using the Stop Work Order Form until corrective actions is implemented for observed serious hazards or conditions. Update the Observed Hazard Form to document corrective actions have been taken. The subcontractor is responsible for determining and implementing necessary controls and corrective actions.

### **4.3.2 Stop Work Order**

CH2M HILL has the authority, as specified in the contract, and the responsibility to stop work in the event any CH2M HILL employee observes unsafe conditions or failure of the subcontractor to adhere to its safe-work practices, or observes a condition or practice that may result in a release or violation of an environmental requirement. This authority and action does not in any way relieve the subcontractor of its responsibilities for the means and methods of the work or, therefore, of any corrective actions. Failure to comply with safe work practices can be the basis for restriction or removal of the subcontractor staff from the job site, termination of the subcontract, restriction from future work, or all three.

When an apparent imminent danger is observed, immediately stop work and alert all affected individuals. Remove all affected CH2M HILL employees and subcontractor staff from the danger, notify the subcontractor's supervisor or safety representative, and do not allow work to resume until adequate corrective measures are implemented. Notify the PM, Contract Administrator (KA) and RHSM.

When repeated non-compliance or unsafe conditions are observed, notify the subcontractor's supervisor or safety representative and stop affected work by completing and delivering the Stop Work Order Form (attached to the project safety plan) until adequate corrective measures are implemented. Consult the KA to determine what the contract dictates for actions to pursue in event of subcontractor non-compliance including work stoppage, back charges, progress payments, removal of subcontractor manager, monetary penalties, or termination of subcontractor for cause.

## **4.4 Incentive Program**

Each project is encouraged to implement a safety incentive program that rewards workers for exhibiting exemplary safety behaviors. Actions that qualify are those that go above and beyond what is expected. Actions that will be rewarded include spotting and correcting a hazard, bringing a hazard to the attention of your foreman, telling your foreman about an incident, coming up with a safer way to get the work done, or stopping a crew member from doing something unsafe. The program will operate throughout the project, covering all workers. The incentive program will be communicated to all employees during the project employee orientation and project safety meetings.

## **4.5 Reporting Unsafe Conditions/Practices**

Responsibility for effective health and safety management extends to all levels of the project and requires good communication between employees, supervisors, and management. Accident prevention requires a pro-active policy on near misses, close calls, unsafe conditions, and unsafe practices. All personnel must report any situation, practice, or condition which might jeopardize the safety of our projects. All unsafe conditions or unsafe practices will be corrected immediately. CH2M HILL has zero tolerance of unsafe conditions or unsafe practices.

No employee or supervisor will be disciplined for reporting unsafe conditions or practices. Individuals involved in reporting the unsafe conditions or practices will remain anonymous.

The following reporting procedures will be followed by all project employees:

- Upon detection of any unsafe condition or practice, the responsible employee will attempt to safely correct the condition;
- The unsafe condition or practice will be brought to the attention of the worker's direct supervisor, unless the unsafe condition or practice involves the employee's direct supervisor. If so, the SC needs to be notified at once by the responsible employee;

- Either the responsible employee or responsible employee's direct supervisor is responsible for immediately reporting the unsafe condition or practice to the SC;
- The SC will act promptly to correct the unsafe condition or practice; and
- Details of the incident or situation will be recorded by the SC in the field logbook or use the Observed Hazard Form if subcontractor was involved.



## Safety Planning and Change Management

---

### 5.1 Daily Safety Meetings and Pre-Task Safety Plans

Daily safety meetings are to be held with all project personnel in attendance to review the hazards posed and required HSE procedures and AHAs that apply for each day's project activities. The Pre-Task Safety Plans (PTSPs) serve the same purpose as these general assembly safety meetings, but the PTSPs are held between the crew supervisor and their work crews to focus on those hazards posed to individual work crews.

At the start of each day's activities, the crew supervisor completes the PTSP, provided as an attachment to the project safety plan, with input from the work crew, during their daily safety meeting. The day's tasks, personnel, tools and equipment that will be used to perform these tasks are listed, along with the hazards posed and required HSE procedures, as identified in the Handbook and AHA. The use of PTSPs promotes worker participation in the hazard recognition and control process while reinforcing the task-specific hazard and required HSE procedures with the crew each day.

### 5.2 Change Management

These Guidelines and the project safety plan address all known activities and associated hazards. As work progresses, if significant changes are identified which could affect health and safety at the site, coordinate with the RHSM to determine whether an update to the safety plan and/or these Guidelines are necessary. Follow the change management protocol in the safety plan.

The following are examples of changes that may require a revision to the plan:

- Change in CH2M HILL staff;
- New subcontractor to perform work;
- New chemicals brought to site for use;
- Change in scope or addition of new tasks;
- Change in contaminants of concern (COCs) or change in concentrations of COCs; and
- New hazards or hazards not previously identified that are not addressed in these Guidelines or the project safety plan.

### 5.3 Agency Inspection Guidance

(Reference CH2M HILL SOP HSE-201, *Agency Inspections and Communications*)

Agency inspections (e.g., OSHA, EPA, other regulatory agencies) are on the rise. CH2M HILL implements safety and environmental programs in order to ensure safety to workers, the public, and the environment. Field personnel need to contact the RHSM to update the project safety plan if hazards are encountered that are not addressed.

[SOP HSE-201](#) addresses agency inspections in detail. It is critical to make immediate notification to the RHSM if an inspector arrives (and EM if it is environmental-related); they can help facilitate and make additional notifications.

Review the Target Zero Bulletin attached to the project safety plan. Make it a topic at a safety meeting and keep it readily available in the event of an inspection.

## SECTION 6

# Project Hazard Analysis

---

A health and safety risk analysis is performed for each task of a given project. In the order listed below, the RHSM considers the various methods for mitigating the hazards. Employees are trained on this hierarchy of controls during their hazardous waste training and reminded of them throughout the execution of projects:

- Elimination of the hazards (use remote sampling methodology to avoid going into a confined space);
- Substitution (reduce exposure to vapors by using of a geoprobe instead of test pitting);
- Engineering controls (ventilate a confined space to improve air quality);
- Warnings (establish exclusion zones to keep untrained people away from hazardous waste work);
- Administrative controls (implement a work-rest schedule to reduce chance of heat stress); or
- Use of PPE (use of respirators when action levels are exceeded).

Employees are trained on the hierarchy of controls during their hazardous waste training and reminded of them throughout the execution of projects.

## 6.1 Activity Hazard Analysis

An AHA must be developed for each CH2M HILL field activity. The AHA shall define the work tasks required to perform each activity, along with potential HSE hazards and recommended control measures for each hazard. In addition, a listing of the equipment to be used to perform the activity, inspection requirements to be performed and training requirements for the safe operation of the equipment listed must be identified. Workers are briefed on the AHA before performing the work and their input is solicited prior, during, and after the performance of work to further identify the hazards posed and control measures required.

## 6.2 Subcontractor Activity Hazard Analysis

CH2M HILL subcontractors are required to provide AHAs specific to their scope of work on the project for acceptance by CH2M HILL. Each subcontractor shall submit AHAs for their field activities, as defined in their scope of work, along with their project safety plan and procedures. Additions or changes in field activities, equipment, tools, or material used to perform work or hazards not addressed in existing AHAs requires either a new AHA to be prepared or an existing AHA to be revised.

## SECTION 7

# General Hazards and Controls

---

This section provides safe work practices and control measures used to reduce or eliminate potential hazards. It is a summarized list of requirements. Always consult the appropriate CH2M HILL SOP to ensure all requirements are implemented.

## 7.1 Bloodborne Pathogens

(Reference CH2M HILL SOP HSE-202, *Bloodborne Pathogens*)

Exposure to bloodborne pathogens may occur when rendering first aid or cardiopulmonary resuscitation (CPR), or when coming into contact with landfill waste or waste streams containing potentially infectious material (PIM).

Employees trained in first-aid/CPR or those exposed to PIM must complete CH2M HILL's 1-hour bloodborne pathogens computer-based training module annually. When performing first-aid/CPR the following shall apply:

- Observe universal precautions to prevent contact with blood or other PIMs. Where differentiation between body fluid types is difficult or impossible, consider all body fluids to be potentially infectious materials;
- Always wash your hands and face with soap and running water after contacting PIMs. If washing facilities are unavailable, use an antiseptic cleanser with clean paper towels or moist towelettes; and
- If necessary, decontaminate all potentially contaminated equipment and surfaces with chlorine bleach as soon as possible. Use one part chlorine bleach (5.25 percent sodium hypochlorite solution) diluted with 10 parts water for decontaminating equipment or surfaces after initially removing blood or other PIMs. Remove contaminated PPE as soon as possible before leaving a work area.

CH2M HILL will provide exposed employees with a confidential medical examination should an exposure to PIM occur. This examination includes the following procedures:

- Documenting the exposure;
- Testing the exposed employee's and the source individual's blood (with consent); and
- Administering post-exposure prophylaxis.

## 7.2 Chemical Storage

The following is general guidance for storing chemicals and other hazardous materials:

- Keep acids away from bases;
- Keep oxidizers (nitric acid, nitrates, peroxides, chlorates) and organics away from inorganic reducing agents (metals);
- Keep flammables and corrosives in appropriate storage cabinets;
- Do not store paper or other combustibles near flammables;
- Use secondary containment and lipped shelving that is secured; and
- Have a fire suppression system available.

### 7.2.1 Storage of Flammable/Combustible Liquids

- Only approved containers and portable tanks shall be used for storage and handling of flammable and combustible liquids.
- Approved safety cans shall be used for the handling and use of flammable liquids in quantities of 5 gallons (19 liters) or less. Do not use plastic gas cans.

- For quantities of 1 gallon (3.78 liters) or less, the original container may be used for storage and use of flammable liquids.
- Flammable or combustible liquids shall not be stored in areas used for stairways or normally used for the passage of people.

### **7.2.2 Indoor Storage of Flammable/Combustible Liquids**

- No more than 25 gallons (95 liters) of flammable or combustible liquids shall be stored in a room outside of an approved storage cabinet.
- Quantities of flammable and combustible liquids in excess of 25 gallons (95 liters) shall be stored in an acceptable or approved cabinet.
- Cabinets shall be conspicuously lettered: "FLAMMABLE: KEEP FIRE AWAY."
- Not more than 60 gallons (228 liters) of flammable or 120 gallons (456 liters) of combustible liquids shall be stored in any one storage cabinet. Not more than three such cabinets may be located in a single storage area.

### **7.2.3 Outside Storage of Flammable/Combustible Liquids**

- Storage of containers (not more than 60 gallons [228 liters] each) shall not exceed 1,100 gallons (4,180 liters) in any one area. No area shall be within 20 feet (6.1 meters) of any building.
- Storage areas shall be graded to divert spills away from buildings and surrounded by an earthen dike.
- Storage areas may not be located near a storm drain. Overflow and spills must be diverted away from storm drains or surface waters.
- Storage areas shall be free from weeds, debris, and other combustible materials.
- Outdoor portable tanks shall be provided with emergency vent devices and shall not be closer than 20 feet (6.1 meters) to any building.
- Signs indicating no smoking shall be posted around the storage area.

### **7.2.4 Storage of Hazardous Waste**

- All facilities storing ignitable and combustible liquids and hazardous wastes must be designed, constructed, maintained, and operated to minimize the possibility of a fire, explosion, or any release of hazardous constituents.
- Flammable wastes should be stored more than 50 feet from the property line.

### **7.2.5 Storage of Chemical Injection Chemicals/Materials**

- When chemical injection remediation technologies are being used at a site, the following storage guidelines must be followed:
- Some injection chemicals, such as strong oxidizers, may have stringent storage requirements per local or National Fire Codes. Verify that appropriate storage provisions are in place prior to starting work.
- NOTE: Counties and cities may have requirements specific to storing these chemicals. Also, storage and use of certain chemicals such as potassium permanganate and hydrogen peroxide may be subject to the new Chemical Facility Anti-Terrorism Standards of the Department of Homeland Security – the applicability depends on the chemical, quantity/concentration, and type of facility. Please contact the project Environmental Manager to determine whether chemicals are subject to these standards.
- Injection chemicals must be stored in a designated, secured area with spill prevention capabilities. Review Safety Data Sheet (SDS) or other information to determine potential incompatible materials. Incompatible materials shall not be stored together. Ensure all containers are labeled.

## 7.3 Driving Safety

(Reference CH2M HILL HSE Policy 205, *Distracted Driving – Wireless Devices, Vehicle Safety Core Standard*)

All CH2M HILL employees are prohibited from using wireless devices while operating a motor vehicle when conducting company business regardless of the location or vehicle ownership and whether or not during regular working hours.

All CH2M HILL contractors and subcontractors are prohibited from using wireless devices while operating a CH2M HILL- or CH2M HILL client-owned, leased, or rented motor vehicle, or while operating any other Motor Vehicle on the project site.

Avoid distractions from wireless devices (e.g., mobile phones, smartphones, voice recognition systems, PDAs, notebook, tablets, or laptops) by turning off or silencing the wireless devices before operating a motor vehicle.

- Prohibited use includes the following:
  - Dialing or speed dialing
  - Using a hands-free or voice recognition (blue tooth) device to dial or speed dial
  - Engaging in conversation or listening to a conversation using a wireless device
  - Checking emails or surfing the internet using a wireless device
  - Texting or e-mailing (reading, sending, or screening) with a wireless device
  - Programming or entering coordinates into a global positioning system (GPS) device (following directions by a GPS is permitted)
  - Using a wireless device for voice recording or dictation
  - Employees, contractors, and subcontractors who need to use a wireless device must pull off the road to a safe location, with the vehicle securely stopped and emergency flashers on, or wait until they reach their destination.

Follow the guidance below when operating a vehicle:

- All vehicles have blind spots to the side and the rear. Follow these safe practices for backing up:
  - Walk around your vehicle prior to moving
  - Try to position your vehicle so that you don't have to back up
  - Back into the space if possible when you're parking
  - Back to the left, if possible, so that you can see objects on the driver's side
  - Have a spotter guide your vehicle when you're backing up
  - Apply GOAL (Get Out And Look)
- Obey speed limits; be aware of blind spots or other hazards associated with low visibility. Practice defensive driving techniques, such as leaving plenty of room between your vehicle and the one ahead of you;
- Do not drive while drowsy. Drowsiness can occur at any time, but is most likely after 18 hours or more without sleep;
- Maintain focus on driving. Eating, drinking, smoking, adjusting controls can divert attention from the road. Take the time to park and perform these tasks when parked rather than while driving; and
- Ensure vehicle drivers are familiar with the safe operation of vehicles of the type and size to be operated. Large vehicles such as full size vans and pick-ups have different vision challenges and handling characteristics than smaller vehicles.

## 7.4 Electrical Safety

(Reference CH2M HILL SOP HSE-206, *Electrical Safety*)

Below are the hazard controls and safe work practices to follow when using electrical tools, extension cords, and/or other electrical-powered equipment or when exposed to electrical hazards. Ensure the requirements of the referenced SOP are followed:

- Only qualified personnel are permitted to work on unprotected energized electrical systems;
- Only authorized personnel are permitted to enter high-voltage areas;
- CH2M HILL employees who might from time to time work in an environment influenced by the presence of electrical energy must complete Awareness Level Electrical Safety Training located on the CH2M HILL Virtual Office;
- Do not tamper with electrical wiring and equipment unless qualified to do so. All electrical wiring and equipment must be considered energized until lockout/tagout procedures are implemented;
- Inspect electrical equipment, power tools, and extension cords for damage prior to use. Do not use defective electrical equipment, remove from service;
- CH2M HILL has selected Ground Fault Circuit Interrupters (GFCIs) as the standard method for protecting employees from the hazards associated with electric shock;
  - GFCIs shall be used on all 120-volt, single phase 15 and 20-ampere receptacle outlets which are not part of the permanent wiring of the building or structure.
- An assured equipment grounding conductor program may be required under the following scenarios:
  - GFCIs cannot be utilized;
  - Client requires such a program to be implemented; or
  - Business group decides to implement program in addition to GFCI protection.
- Extension cords must be equipped with third-wire grounding. Cords passing through work areas must be covered, elevated or protected from damage. Cords should not be routed through doorways unless protected from pinching. Cords should not be fastened with staples, hung from nails, or suspended with wire;
- Electrical power tools and equipment must be effectively grounded or double-insulated and Underwriters Laboratory (UL) approved;
- Operate and maintain electric power tools and equipment according to manufacturers' instructions;
- Maintain safe clearance distances between overhead power lines and any electrical conducting material unless the power lines have been de-energized and grounded, or where insulating barriers have been installed to prevent physical contact. Maintain at least 10 feet (3 meters) from overhead power lines for voltages of 50 kV or less, and 10 feet (3 meters) plus 0.4 inches (1.0 cm) for every 1 kV over 50 kV;
- Temporary lights shall not be suspended by their electric cord unless designed for suspension. Lights shall be protected from accidental contact or breakage; and
- Protect all electrical equipment, tools, switches, and outlets from environmental elements.

## 7.5 Field Ergonomics and Manual Lifting

(Reference CH2M HILL SOP HSE-112, *Manual Lifting*)

Some of the most common injuries during field work are the result of performing work in an awkward body position (poor ergonomics) or pushing the body beyond its natural limits. Workers who have to lift, stoop, kneel, twist, grip, stretch, reach overhead, or work in other awkward positions regularly are at risk of developing

discomfort or even an injury. Additionally, back injuries are one of the leading causes of work disability and most back injuries are the result of improper lifting techniques or overexertion.

Contact the RHSM to determine hazard control measures if your task involves:

- Repetitive motions;
- Lifting and carrying items over long distances (100 feet) or on uneven, steep, or sloped terrain;
- Heavy lifting;
- Use of vibrating tools or equipment; or
- Being in a static position for extended periods of time;

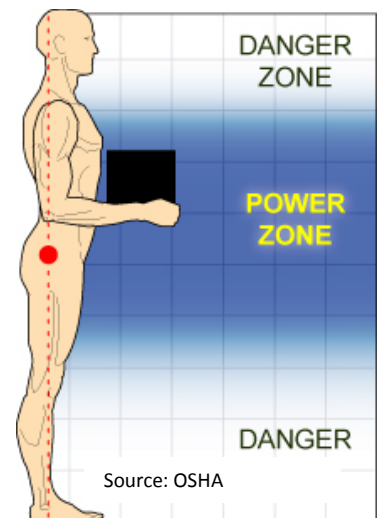
There are a variety of ergonomically designed tools and work practices that can reduce the potential for discomfort and injury. Following are requirements (“must” or “shall”) and recommendations (“should”) to aid in the prevention of discomfort or injuries while working in the field.

### Fitness for Duty

If manual lifting and repetitive activities are not part of your normal work duties, contact your PM and/or RHSM to help determine if you have the physical capability to perform the work. In many cases adding lifting or repetitive tasks to a subcontractor’s scope of work is desirable to prevent injury. If the work task causes any pain or discomfort stop and get assistance.

### Manual Lifting

- All CH2M HILL workers must have training in proper manual lifting either through New Employee Orientation or through the Manual Lifting module located on the VO;
- When possible, the task should be modified to minimize manual lifting hazards or awkward body positions;
- Lifting loads weighing more than 40 pounds (18 kilograms) shall be evaluated by the SC using the Lifting Evaluation Form contained in SOP HSE-112;
- Personnel shall seek assistance when performing manual lifting tasks that appear beyond their physical capabilities.
- Using mechanical lifting devices such as forklifts; cranes, hoists, and rigging; hand trucks; and trolleys; is the preferred means of lifting heavy objects;
- Lift and Work in the Power Zone - The power zone for lifting or working is close to the body, between mid-thigh and mid-chest height. This zone is where arms and back can lift the most with the least amount of effort. This is zone is sometimes referred to as the “strike zone.”
- Work near elbow height to avoid excessive bending (avoid working above the shoulders and below the knees);
- Plan before carrying:
  - Wear appropriate shoes to avoid slips, trips or falls
  - If you wear gloves, wear gloves that fit. Tight-fitting gloves can put pressure on the hands, while loose-fitting gloves reduce grip strength and pose other safety hazards.
  - Avoid carrying large or bulky loads that limit or obstruct your vision
  - Slide, push, or roll instead of carrying when appropriate
  - When there is a choice, push instead of pull
  - Carry only as much as you can safely handle
  - Try to avoid slopes, stairs, or other obstacles that make carrying materials more difficult



- Beware of and try to avoid slippery floors (e.g., liquids, ice, oil, and fine powders)
- Use extra caution when moving loads that may be unstable
- In general, the following steps must be practiced when planning and performing manual lifts:
  - Examine the load and the surrounding area
  - Bend knees when lifting a load
  - Look forward to keep back straight
  - Position the load close to the body
  - Maintain a firm grip on the load
  - Test the load for stability and weight prior to lifting
  - Use smooth, controlled movements
  - Keep arms in front of body
  - Turn feet in direction of movement to avoid twisting
- Avoid carrying objects more than 100 feet;

#### Ergonomic Work Practices

- Avoid repetitive motions, overhead reaching, and kneeling when possible;
- If prolonged awkward postures are unavoidable, use a “supported” posture to compensate; a supported posture uses part of your body to support the weight of another body segment that is in an awkward position;
- Watch your pace—attempting to do something faster can cause you to lose proper form;
- Use a table or move work to a location where you don’t have to be in a bent-over position to do your work; and
- Where awkward postures or repetitive motions are unavoidable, rotate with another worker, change tasks, stretch, and take short breaks frequently.

## **7.6 Field Trailer/Office Setup and Maintenance**

- Determine trailer placement by considering all potential hazards that could impact “office” work. Trailers usually are placed in the support zone and out of construction zones. Think about what type of PPE will be necessary when exiting the trailer, parking needs, biological hazards or other hazards that could impact location.
- Check utility configuration prior to placement, including electrical, water, and sewer.
- Use spotters when placing trailer.
- Set on flat ground.
- Be sure trailer wheels are chocked.
- When disconnecting trailer from hitch—watch pinch points and wear leather gloves.
- Carefully jack trailer using the appropriately rated jacks and following manufacturer’s recommendations.
- Secure and anchor trailer to protect from wind or other severe weather.
- Place cones in front of hitch.
- Ensure proper stairs and secure stairs next to doors. Ensure stairs are “no slip” and that the platform or landing of the stairs is flush the door threshold.
- Use only qualified electricians to establish electrical service.
- Consider ergonomics when furnishing trailer with desks and chairs.



- Place fire extinguishers near doors, and place signage.
- Put up emergency contacts, evacuation and rally point map, and route to the hospital
- Place right to know posters (OSHA required information).
- Place signage on exit doors.
- Never place porta-johns at HVAC intake (usually HVAC is located at the front of trailer).
- Have capability to properly store food—temporary field offices can quickly develop rodent issues if food is not stored properly or the trailer isn't cleaned regularly.

## 7.7 Field Vehicles

- Field vehicles may be personal vehicles, rental vehicles, fleet vehicles, or project vehicles.
- Maintain a first aid kit and bloodborne pathogen kit in the field vehicle.
- Assess whether maintaining a fire extinguisher in the field vehicle is feasible. If fire extinguishers are readily available, for example on heavy equipment, or if the project is short duration, a fire extinguisher would not be necessary. Fire extinguishers in field vehicles need to be properly secured and inspected on a monthly basis.
- Utilize a rotary beacon on vehicle if working adjacent to active roadway.
- Familiarize yourself with rental vehicle features prior to operating the vehicle:
  - Vision Fields and Blind Spots
  - Vehicle Size
  - Mirror adjustments
  - Seat adjustments
  - Cruise control features, if offered
  - Pre-program radio stations and Global Positioning System (GPS), if equipped
- Always wear seatbelt while operating vehicle.
- Adjust headrest to proper position.
- Tie down loose items if utilizing a van or pick-up truck.
- Close car doors slowly and carefully. Fingers can get pinched in doors.
- Park vehicle in a location where it can be accessed easily in the event of an emergency. If not possible, carry a phone.
- Have a designated place for storing the field vehicle keys when not in use.
- Ensure back-up alarms are functioning, if equipped. Before backing a vehicle, take a walk around the vehicle to identify obstructions or hazards. Use a spotter when necessary to back into or out of an area.
- See the Vehicle Incident Guidance attached to the project safety plan, if a vehicle incident is experienced in a rental or fleet vehicle.

## 7.8 Fire Prevention

(Reference CH2M HILL SOP HSE-403, *Hazardous Material Handling*)

Follow the fire prevention and control procedures listed below.

### 7.8.1 Fire Extinguishers and General Fire Prevention Practices

- Fire extinguishers shall be provided so that the travel distance from any work area to the nearest extinguisher is less than 100 feet (30.5 meters). When 5 gallons (19 liters) or more of a flammable or combustible liquid is being used, an extinguisher must be within 50 feet (15.2 meters). Extinguishers must:
  - be maintained in a fully charged and operable condition;
  - be visually inspected each month; and
  - undergo a maintenance check each year.
- The area in front of extinguishers must be kept clear.
- Post “Exit” signs over exiting doors, and post “Fire Extinguisher” signs over extinguisher locations.
- Combustible materials stored outside should be at least 10 feet (3 meters) from any building.
- Solvent waste and oily rags must be kept in a fire resistant, covered container until removed from the site.
- Keep areas neat. Housekeeping is important.

### 7.8.2 Dispensing of Flammable/Combustible Liquids

- Areas in which flammable or combustible liquids are dispensed in quantities greater than 5 gallons (22.7 liters) (shall be separated from other operations by at least 25 feet (7.6 meters).
- Drainage away from storm drains or surface waters or other means of containment shall be provided to control spills.
- Adequate natural or mechanical ventilation shall be provided to maintain the concentration of flammable vapor at or below 10 percent of the lower flammable limit.
- Dispensing of flammable liquids from one container to another shall be done only when containers are electrically interconnected (bonded).
- Dispensing flammable or combustible liquids by means of air pressure on the container or portable tanks is prohibited.
- Dispensing devices and nozzles for flammable liquids shall be of an approved type.

## 7.9 General Practices and Housekeeping

The following are general requirements applicable to all portions of the work:

- Site work should be performed during daylight hours whenever possible;
- Good housekeeping must be maintained at all times in all project work areas;
- Common paths of travel should be established and kept free from the accumulation of materials;
- Keep access to aisles, exits, ladders, stairways, scaffolding, and emergency equipment free from obstructions;
- Provide slip-resistant surfaces, ropes, or other devices to be used;
- Specific areas should be designated for the proper storage of materials;
- Tools, equipment, materials, and supplies shall be stored in an orderly manner;
- As work progresses, scrap and unessential materials must be neatly stored or removed from the work area;
- Containers should be provided for collecting trash and other debris and shall be removed at regular intervals;
- All spills shall be quickly cleaned up; oil and grease shall be cleaned from walking and working surfaces;

- Review the safety requirements of each job you are assigned to with your supervisor. You are not expected to perform a job that may result in injury or illness to yourself or to others;
- Familiarize yourself with, understand, and follow jobsite emergency procedures;
- Do not fight or horseplay while conducting the firm's business;
- Do not use or possess firearms or other weapons while conducting the firm's business;
- Report unsafe conditions or unsafe acts to your supervisor immediately;
- Report emergencies, occupational illnesses, injuries, vehicle accidents, and near misses immediately;
- Do not remove or make ineffective safeguards or safety devices attached to any piece of equipment;
- Report unsafe equipment, defective or frayed electrical cords, and unguarded machinery to your supervisor;
- Shut down and lock out machinery and equipment before cleaning, adjustment, or repair. Do not lubricate or repair moving parts of machinery while the parts are in motion;
- Do not run in the workplace;
- When ascending or descending stairways, use the handrail and take one step at a time;
- Do not apply compressed air to any person or clothing;
- Do not wear steel taps or shoes with metal exposed to the sole at any CH2M HILL project location;
- Do not wear finger rings, loose clothing, wristwatches, and other loose accessories when within arm's reach of moving machinery;
- Remove waste and debris from the workplace and dispose of in accordance with federal, state, and local regulations;
- Note the correct way to lift heavy objects (secure footing, firm grip, straight back, lift with legs), and get help if needed. Use mechanical lifting devices whenever possible; and
- Check the work area to determine what problems or hazards may exist.

## 7.10 Hazard Communication

(Reference CH2M HILL SOPs HSE-107, *Hazard Communication* and HSE-403, *Hazardous Material Handling*)

The hazard communication coordinator is to perform the following:

- Complete an inventory of chemicals brought on site by CH2M HILL using the chemical inventory form included as an attachment to the project safety plan;
- Confirm that an inventory of chemicals brought on site by CH2M HILL subcontractors is available;
- Request or confirm locations of safety data sheets (SDSs) from the client, contractors, and subcontractors for chemicals to which CH2M HILL employees potentially are exposed;
- Before or as the chemicals arrive on site, obtain an SDS for each hazardous chemical and include on the chemical inventory sheet (attached to the project safety plan) and add the SDS to the SDS onsite notebook;
- Label chemical containers with the identity of the chemical and with hazard warnings, and store properly;
- Give employees required chemical-specific HAZCOM training using the chemical-specific training form included as an attachment to the project safety plan; and
- Store all materials properly, giving consideration to compatibility, quantity limits, secondary containment, fire prevention, and environmental conditions.

## 7.11 Knife Use

Open-bladed knives (for example, box cutters, utility knives, pocket knives, machetes, and multi-purpose tools with fixed blades such as a Leatherman™) are prohibited at worksites except where the following three conditions are met:

- The open-bladed knife is determined to be the best tool for the job;
- An approved Activity Hazard Analysis (AHA) or written procedure is in place that covers the necessary safety precautions (work practices, PPE, and training); and
- Knife users have been trained and follow the AHA
- Employees are responsible for using cutting tools in the way they are intended, maintaining them in good working order and reporting faulty or unusable items. PPE as specified in the AHA is to be used.
- Those engaging and supervising subcontractors are to ensure that the requirements of this policy are communicated.
- The most appropriate gloves shall be identified within the AHA. In general, cut resistant gloves (e.g., Kevlar) are to be worn when using a knife in an occupational setting. Other types of gloves may be required and will be identified within the AHA. An example may be leather gloves may be worn when using the acetate sleeve cutter.
- All employees that will use a cutting tool must be trained in the proper use.
- Position the item to be cut on a stable surface. Secure it to prevent slippage, wherever possible. Select a work location which does not put your body in the line of fire of a knife slippage or failure.
- When using a knife do not cut towards yourself.
- When cutting, make the force of the cut carry the blade away from any part of your body. If you have a situation where this is not possible, protect yourself with a leather apron, or other material placed between you and the blade. Consider putting the material to be cut in a vise, or other holding device.
- Many tasks using a utility knife require a knife edge but not a sharp point. For these tasks you can add protection against puncture wounds by using a rounded-tip blade.
- In general, a pocket knife is not the preferred tool of choice as there are alternatives (e.g., retracting safety blade). If you use a folding knife, it must be a locking blade type. Never use a knife that will fold under pressure. If you use a fixed blade knife, make sure there is a handle guard to keep your hand from slipping forward. Also, make sure the handle is dry and non-greasy/slippery to assure a better grip. If you carry a fixed blade knife, use a sheath or holder.
- Store utility knives safely, retract the blade or sheath an open blade before storing. Never, leave a knife with the blade exposed on the floor, on a pallet, on a work surface, or in a drawer or cabinet.
- Keep your knife sharp. A dull blade requires you to use more force to cut, and consequently increases the risk of slip or mistake.
- Knives used on the job, but not carried with you, must be properly stored when not in use
- Never use a defective knife.
- Utility knife blades are brittle and can snap easily. Don't bend them or apply side loads to them by using them to open cans or pry loose objects. Use the knife only to cut. It was not designed to work as a pry bar, screwdriver, or hole punch.

## 7.12 Lighting

Lighting shall be evaluated when conducting work inside buildings, confined spaces, or other areas/instances where supplemental light may be needed (e.g., work before sunrise or after sunset). A light meter can be used to evaluate the adequacy of lighting. The following are common requirements for lighting and the conditions/type of work being performed:

- While work is in progress outside construction areas shall have at least 33 lux (lx);
- Construction work conducted inside buildings should be provided with at least 55 lux light;
- The means of egress shall be illuminated with emergency and non-emergency lighting to provide a minimum 11 lx measured at the floor. Egress illumination shall be arranged so that the failure of any single lighting unit, including the burning out of an electric bulb will not leave any area in total darkness.

## 7.13 Manual Lifting

(Reference CH2M HILL SOP HSE-112, *Manual Lifting*)

Back injuries are the leading cause of disabling work and most back injuries are the result of improper lifting techniques or overexertion. Use the following to mitigate the hazards associated with lifting:

- When possible, the task should be modified to minimize manual lifting hazards;
- Lifting of loads weighing more than 40 pounds (18 kilograms) shall be evaluated by the SC using the Lifting Evaluation Form contained in SOP HSE-112;
- Using mechanical lifting devices is the preferred means of lifting heavy objects such as forklifts; cranes, hoists, and rigging; hand trucks; and trolleys;
- Personnel shall seek assistance when performing manual lifting tasks that appear beyond their physical capabilities;
- In general, the following steps must be practiced when planning and performing manual lifts: Assess the situation before you lift; ensure good lifting and body positioning practices; ensure good carrying and setting down practices; and
- All CH2M HILL workers must have training in proper manual lifting training either through the New Employee Orientation or through Manual Lifting module located on the VO.

## 7.14 Personal Hygiene

Good hygiene is essential for personal health and to reduce the potential of cross-contamination when working on a hazardous waste site. Implement the following:

- Keep hands away from nose, mouth, and eyes during work;
- Keep areas of broken skin (chapped, burned, etc.) covered; and
- Wash hands with soap and water prior to eating, smoking, or applying cosmetics.

## 7.15 Personal Security

Follow the guidelines below for personal security measures. The RHSM and Firm-Wide Security Office can be contacted if additional, specific measures are needed (e.g., such as evaluating the needs for security service).

### General Safety and Security Guidelines

CH2M HILL Corporate Security Department recommends the following guidelines for workers in the United States:

- Stay alert and be aware of your surroundings. Avoid pre-occupations with mobile devices, while in an unfamiliar area.

- Whenever possible use the buddy system with another employee or client or subcontractor employee.
- Trust your intuition; if a situation appears strange or wrong, it probably is.
- Be confident in your walk or stride; do not give the appearance you are new in town.
- Avoid carrying and displaying large sums of cash.
- If you sense or see dangerous situations along your route, change your route and depart the area quickly. If you feel that you are being followed, go to the nearest police station or safe location and file a complaint with the police. Provide a description of the person, their vehicle, license plate number and any other useful information.
- Only walk short distances that are safe and secure while visiting an unfamiliar city or location.
- Take host approved transportation for long distances.
- “Fight or Flight?” Leaving the possible or dangerous area is always better than staying to fight.
- Always report suspicious activity to the nearest local law enforcement agency.
- Locate emergency exits in your hotel or where you are staying to ensure you know where to go in case of a fire or a natural or man-made disaster.
- Secure your electronic devices when left in your room or take them with you if you are not able to secure them properly.
- If you feel your life is in danger, call 911. Be sure to speak clearly, concisely and give the dispatcher a good description of where you are physically located.

### **Operating or Riding in Vehicles**

- When waiting for public transportation or a taxi, remain in a store or restaurant as long as possible before catching your ride and never wait by yourself in an isolated area.
- Approach your vehicle with keys firmly in your hand and ready to unlock the car.
- Quickly check your car before entering it to determine damage or presence of an intruder.
- Vulnerable times can be stopping to find your keys to enter your vehicle or stepping out of your vehicle in an isolated area. Be aware of your surroundings before you perform these activities.
- Always keep your doors locked during transit and when the vehicle is parked.
- Never leave your vehicle unlocked, even when performing a quick task such as checking in a hotel, getting gas or going picking up food.
- If confronted by an individual inside a vehicle pointing a weapon at you, run the opposite way from where the vehicle is facing and scream as loud as you can. This evasive action will probably cause the individual to drive away.
- If an individual in a passing car points at your tires or engine to indicate a malfunction, only pull over in a well-lit and populated gas or rest stop. Never pull over in an isolated or dimly lit area. You may have a malfunction or the passing motorist may be attempting to rob you.
- Always park your vehicle in a well-lit and secure area. If your vehicle is parked in a dimly lit or isolated area in a parking garage; ask an attendant or friend to accompany you to your vehicle.
- Secure your valuables in the trunk, or place them out of sight or cover them with a blanket or coat if there is no secure storage area in the vehicle. The would-be-perpetrator likes to see what to steal and not knowing what you have concealed will normally prevent a break in.

## **Riding in a Taxi**

- Have your host or a designated travel agent suggest or reserve a reputable taxi service for you during your stay.
- Only use a taxi service that was vetted for safety and reliability.
- If possible, place luggage, laptop and personal belongings inside the taxi.
- When you first enter the taxi, check the driver photo identification card, normally located on the driver's visor with the driver to ensure they match.

## **Walking**

- If you experience automotive trouble, remain inside the locked vehicle and call for assistance.
- If you can't reach assistance via a mobile phone, only walk for help in a safe area facing the traffic.
- If while walking, you are shadowed or followed by a vehicle, run back in the direction of your vehicle and enter the vehicle if possible. File a police report on the incident as soon as practicable.
- Be aware of your surroundings and those around you while walking and do not be distracted by using electronic devices.
- Regularly change your route if you are walking to and from meetings or conferences and choose only well-lit areas to walk in at night.
- If walking long distances, identify a "safe house, shop, store or restaurant" to duck into if confronted by a perpetrator.

## **Jogging or Running**

- Always jog or run in an area that is safe, secure, and used for exercising.
- Avoid running along busy roads or highways.
- If you chose to venture out on a jog or run, check the route by vehicle prior to beginning to exercise.
- Let the host or a friend know when you leave, when you plan to return, and the route you will take during exercising.
- Take a photo identification and mobile phone with you for emergencies.
- Avoid physically over-extending yourself since reflexes and decision-making ability can be impaired.

## **Clothing and Jewelry**

- Dress to blend in with locals, maintain a low profile and avoid drawing attention to yourself.
- Travel with inexpensive clothing and jewelry.
- Avoid wearing CH2M HILL distinctive clothing or using CH2M HILL logos on luggage or laptops.

## **Emergency Numbers and Information**

- Leave your itinerary and emergency contact numbers where you can be reached with family members and only those that have a need to know.
- Pre-program emergency numbers in the mobile device you are traveling with.
- Carry a list of current medications and specific doses in your purse or wallet.
- Record medical emergency information on a document that can be readily available if you are unable to speak or unconscious.

- Have a photo copy of your driver's license, passport, and credit card information separately in case your wallet or purse is stolen.

## 7.16 Shipping and Transportation of Hazardous Materials

(Reference CH2M HILL SOP HSE-417, *Hazardous Materials Transportation*)

The U.S. Department of Transportation (DOT) has specific regulations governing shipping of hazardous materials (also called dangerous goods). Chemicals brought to the site might be defined as hazardous materials by the U.S. DOT. Hazardous wastes that may be shipped offsite are also defined as hazardous materials by U.S. DOT. Other wastes may also be U.S. DOT hazardous materials. To confirm whether a material or a waste is a U.S. DOT hazardous material, check with the ESBG Waste Coordinator (Lisa Schwan/ATL), the project EM, or the CH2M HILL Dangerous Goods Shipping Coordinators (John Blasco/BAO or Rob Strehlow/MKW).

All staff who affect shipment of hazardous materials, including receiving hazardous materials, preparing profiles or manifests, packaging hazardous wastes, labeling, or transporting hazardous materials by road, are called HazMat employees (note CH2M HILL cannot transport hazardous wastes by public road). HazMat employees must receive CH2M HILL online training in shipping dangerous goods. CH2M HILL's online Dangerous Goods Shipping course can be found on the CH2M HILL HSSE website.

All hazardous materials that are shipped (e.g., via Federal Express) or are transported by road must be properly identified, labeled, packed, and documented by trained staff. If the material is a product that is being shipped (e.g., calibration gas), use the HazMat ShipRight tool on the CH2M HILL virtual office (under Company Resources – Online Shipping). Contact the Dangerous Goods Shipping coordinators, the ESBG Waste Coordinator or the project EM for additional information.

49 CFR 172 requires that all hazmat employees be aware of potential transportation security concerns. Hazardous materials security is addressed in CH2M HILL's Hazardous Materials SOP (HSE-403). The following points are provided as an overview of security measures to increase awareness of this important matter:

- It is essential that each employee understand the security risks involved with transporting hazardous materials;
- All transporters of hazardous materials must be prequalified by a Contracts Administrator who evaluate the carrier's safety rating, security measures, and employee screening procedures;
- When shipping hazardous materials, check driver credentials and ask about shipping details;
- When receiving a hazardous materials shipment, inspect packages for signs of tampering or damage to the contents. Verify the drivers and company information on the form with the driver; and
- If there is suspicious or unusual behavior (e.g., driver without credentials, evasive answers) or any discrepancies identified, do not offer or accept the shipment, and immediately notify the project manager or the RHSM.

Employees responsible for shipping hazard materials must also review the CH2M HILL Transportation Security Plan (HSE-417 Appendix A).

## 7.17 Substance Abuse

(Reference CH2M HILL SOP HSE-105, *Drug-Free Workplace*)

Employees who work under the influence of controlled substances, drugs, or alcohol may prove to be dangerous or otherwise harmful to themselves, other employees, clients, the company, the company's assets and interests, or the public. CH2M HILL does not tolerate illegal drug use, or any use of drugs, controlled substances, or alcohol that impairs an employee's work performance or behavior.



Prohibitions onsite include:

- Use or possession of intoxicating beverages while performing CH2M HILL work;
- Abuse of prescription or nonprescription drugs;
- Use or possession of illegal drugs or drugs obtained illegally;
- Sale, purchase, or transfer of legal, illegal or illegally obtained drugs; and
- Arrival at work under the influence of legal or illegal drugs or alcohol.

Drug and/or alcohol testing is applicable under CH2M HILL Constructors, Inc. and munitions response projects performed in the United States. In addition, employees may be required to submit to drug and/or alcohol testing as required by clients. When required, this testing is performed in accordance with SOP HSE-105, Drug-Free Workplace. Employees who are enrolled in drug or alcohol testing are required to complete annual training located on the CH2M HILL Virtual Office (VO).

## 7.18 Unknown or Suspect Objects/Materials

If unknown or suspect objects/materials are encountered (i.e., exposed or partially buried drums, biological waste, cylinders, glass containers, munitions of explosive concern, unexpected stained/discolored soil) are encountered during site operations, ongoing activities shall be immediately suspended. CH2M HILL or subcontractor personnel encountering unknown or suspect objects or materials shall:

- Secure the area and identify the location of the object/material to the extent possible, without causing bodily injury to yourself or others and without disturbing the object.
- Evacuate the work area.
- Immediately notify the project manager/HSM of the encountered condition.
- Do not further disturb or otherwise handle the suspect object or material.

The site supervisor or SC shall contact the Project Manager and the RHSM to evaluate potential hazards associated with the specific situation encountered. The project team will then address the need for the use of special procedures, engineering controls, PPE or specialized subcontract personnel to safely mitigate the situation.

## SECTION 8

# Project-Specific Hazard Controls

---

This section provides safe work practices and control measures used to reduce or eliminate potential hazards. These practices and controls are to be implemented by the party in control of either the work or the particular hazard. Each person onsite is required to abide by the hazard controls. Always consult the appropriate CH2M HILL SOP to ensure all requirements are implemented. CH2M HILL employees and subcontractors must remain aware of the hazards affecting them regardless of who is responsible for controlling the hazards. CH2M HILL employees and subcontractors who do not understand any of these provisions should contact the RHSM for clarification.

## 8.1 Abrasive Blasting

(Reference CH2M HILL SOP HSE-122, *Abrasive Blasting*)

Abrasive blasting is the cleaning or preparing of a surface by forcibly propelling a stream of abrasive material against the surface using sand, glass bead, aluminum oxide, grit, garnet, steel shot, slag, walnut shells, and others. Below are the hazard controls and safe work practices to follow when overseeing or performing abrasive blasting.

- CH2M HILL employees who work on projects with abrasive blasting operations are required to complete the CH2M HILL 10-Hour Construction Safety Awareness training and waste management training.
- Abrasives and the surface coatings on the materials blasted are shattered and pulverized during blasting operations and the dust formed will contain particles of respirable size. The composition and toxicity of the dust from these sources shall be considered in making an evaluation of the potential health hazards. Air monitoring instruments shall be provided if the potential for a hazardous atmosphere exists.
- Personnel shall remain a safe distance from the abrasive blasting area to reduce exposure to hazardous airborne contaminants.
- Abrasive blasting equipment shall be inspected each day, before use, to ensure safe operational condition.
- Non-silica containing abrasive blasting materials must be used to the extent possible.
- Blast nozzles must be equipped with an operating valve that must be held open manually.
- Eating, drinking, and smoking shall be prohibited in areas where blasting is performed. Employees shall wash their face and hands before eating, drinking or smoking.
- Abrasive blasting debris shall be cleaned up by using dust-free methods. Wet clean-up methods and vacuum cleaners with High Efficiency Particulate Air (HEPA) filters are recommended.
- Fugitive dust must be controlled during abrasive blasting operations by using water sprays or other methods.
- Noise must be monitored and controlled as required by state or local regulations.
- Complete the abrasive blasting self-assessment checklist when performing or when subcontractors perform this operation.

## 8.2 Aerial Lifts

(Reference CH2M HILL, SOP HSE-301, *Aerial Lifts*)

Below are the hazard controls and safe work practices to follow when working around or operating aerial lifts. Ensure the requirements in the referenced SOP are followed:

- Operate aerial lifts only if you are authorized and trained to do so;
- Inspect aerial lifts and test lift controls prior to use;

- Wear a full-body harness, with a lanyard attached to the boom or platform (see also SOP HSE-308, *Fall Protection*). When working within a standard guardrail system with scissors lifts, the full-body harness and lanyard are not required;
- Do not attach lanyard to any adjacent structures or equipment while working from an aerial lift;
- Stand firmly on the floor of the platform and do not sit or climb on the railings of the platform, or use planks, ladders, or other devices to increase working height;
- Remain on the platform at all times and do not leave the platform to climb to adjacent structures;
- Position aerial lifts on firm, level surfaces when possible, with the brakes set. Use wheel chocks on inclines. If outriggers are provided, position them on solid surfaces or cribbing;
- Maintain safe clearance distances between overhead power lines and any part of the aerial lift or conducting material, unless the power lines have been de-energized and grounded, or insulating barriers have been installed to prevent physical contact. Maintain at least 10 feet (3 meters) from overhead power lines for voltages of 50 kilovolts (kV) or less, and 10 feet (3 meters) plus 0.4 inches (1.0 cm) for every 1 kV over 50 kV;
- Do not exceed the boom and basket load limits;
- Do not use aerial lifts as cranes, unless specifically designed and approved by the lift manufacturer;
- Do not work or stand below aerial lift operations;
- Do not use aerial lifts when winds exceed 30 miles per hour (48 km per hour) or per manufacturers recommendations; and
- Complete the self-assessment checklist for aerial lifts whenever aerial lifts are being used.

## 8.3 All-Terrain Vehicles and Utility-Type Vehicle Safety

An all-terrain vehicle (ATV) means any recreational vehicle with three or more tires, has handlebar steering, and a seat designed to be straddled by the operator and are not intended for use on paved roads.

Utility-type vehicle (UTV) means any recreational motor vehicle other than an ATV, motorbike, or snowmobile designed for and capable of travel over designated roads, traveling on four (4) or more tires.

ATVs/UTVs shall not be operated on site unless determined to be the most appropriate vehicle(s) to use and their use is pre-approved by the PM and RHSM.

Operators shall be trained and qualified before operation of the ATV or UTV onsite and will possess a valid driver's license.

ATV/UTV operators are prohibited from using any wireless device while operating ATVs/UTVs. Equipment must be stopped before using devices such as two way radios or cell phones. If a wireless device is required for a certain operation, the PM and HSM must authorize the wireless use on a case by case basis and make sure limitations are addressed in the project safety plan.

Training shall consist of manufacturer's operating manual, hands-on training by a competent person, a demonstration of basic skills, and when required by the state, completion of an ATV safety course. An AHA shall also be developed for the use of ATVs/UTVs and operators shall be trained on the AHA. All individuals are required meet all training aspects before ATV/UTV use and documentation of training shall be maintained at the site.

Some states listed below as requiring an ATV license actually require an ATV or even a motorcycle endorsement on the operator's current driver's license. Be sure to contact the local division of motor vehicles (DMV) office for details. The following are states that require a specialized driver's license: Arizona, Oregon, Georgia, and Illinois. New Hampshire's and Montana's requirements vary by city.

Keep in mind, that states not mentioned above may still:

- Impose age restrictions for operating ATVs;
- Require an ATV safety or education course certification (even if you're older than 18);
- Require ATV insurance.

Daily inspections of vehicles for safety and maintenance are required.

Minimum PPE required for operators and passengers on ATVs include:

- Safety glasses, goggles, or face-shield at all times when moving;
- Leather boots or shoes (if safety-toed boots are not required by the project safety plan); and
- A properly fitted DOT/ANSI/SNELL-approved helmet.

Other safety requirements include:

- ATVs with fewer than four wheels are not allowed on site;
- ATVs and UTVs shall be operated in accordance with the manufacturer's operating manual, any state or client requirements, and task-specific AHA;
- Speed is not to exceed 20 mph. Keep all parts of your body inside any roll over protection;
- Always use the seat belt on UTVs;
- Make sure the engine is turned off before dismounting the vehicle;
- Avoid driving over any extremely large obstacles (i.e., wood/logs, fences, boulders, etc.);
- When using trailers, watch your turning radius;
- Shut engine down prior to refueling;
- ATVs/UTVs must have fenders;
- Utilize high visibility flag and wear high visibility vest when operating adjacent to heavy equipment or haul vehicles.

## 8.4 Arsenic

(Reference CH2M HILL, SOP HSE-501, *Arsenic*)

Arsenic is considered a "Confirmed Human Carcinogen." CH2M HILL is required to control employee exposure to arsenic when exposures are at or above 5.0 micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ ), or if there is the possibility of skin or eye irritation from arsenic. The elements of the CH2M HILL arsenic program include the following:

- Exposure monitoring;
- Methods of control, including PPE and respirators;
- Medical surveillance;
- Training on hazards of arsenic and control measures (includes project-specific training and the computer-based training on CH2M HILL's Virtual Office, *Arsenic Exposure*); and
- Recordkeeping requirements.

If air monitoring indicates there is potential exposure at the action level concentrations, notify the RHSM to ensure the above have been adequately addressed. Full implantation of SOP HSE-501, *Arsenic*, will be required.

Other exposure control measures include:

- Do not enter regulated work areas unless training, medical monitoring, and PPE requirements established by the competent person have been met;

- Do not eat, drink, smoke, chew tobacco or gum, or apply cosmetics in regulated areas;
- Avoid skin and eye contact with liquid and particulate arsenic or arsenic trichloride;
- Respiratory protection and other exposure controls selection shall be based on the most recent exposure monitoring results obtained from the competent person; and
- Review the fact sheet included as an attachment to the SOP.

## 8.5 Asbestos

(Reference CH2M HILL SOP HSE-502, *Asbestos*)

Asbestos is a cancer-causing mineral that was included in many building materials. When disturbed harmful asbestos fibers can be released and inhaled and ingested by workers. Materials suspected of containing asbestos shall be treated as asbestos unless documentation and testing results indicate otherwise. Where the presence of asbestos is suspected, if at all possible, design all operations to avoid contact.

When there is a risk of disturbing asbestos and making it friable (able to release fibers when the materials are crushed, abraded or cut) the activity becomes regulated. The asbestos standard for construction regulates asbestos exposure for the following activities:

- Demolishing or salvaging structures where asbestos is present in concentrations greater than 1 percent;
- Removing or encapsulating asbestos-containing materials (1 percent or greater asbestos content);
- Constructing, altering, repairing, maintaining, or renovating asbestos-containing structures or substrates;
- Installing asbestos containing products;
- Cleaning up asbestos spills/emergencies; and
- Transporting, disposing, storing, containing and housekeeping involving asbestos or asbestos containing products on a construction site.

CH2M HILL is required to control employee exposure to asbestos when exposures are at or above 0.1 fibers per cc (f/cc) by implementing a program that meets the requirements of the OSHA Asbestos standard, 29 Code of Federal Regulations (CFR) 1926.1101. The elements of the CH2M HILL asbestos program include the following:

- Exposure monitoring;
- Methods of control, including PPE and respirators;
- Medical Surveillance;
- Training on hazards of asbestos and control measures; and
- Record keeping requirements.

If air monitoring indicates there is potential exposure at the action level concentrations, notify the RHSM to ensure the above have been adequately addressed. Other exposure control measures include:

- Do not enter regulated work areas unless training, medical monitoring, and PPE requirements established by the competent person have been met;
- Do not eat, drink, smoke, chew tobacco or gum, or apply cosmetics in regulated areas;
- Avoid skin and eye contact asbestos;
- Respiratory protection and other exposure controls selection shall be based on the most recent exposure monitoring results obtained from the competent person;
- Review the fact sheet included as an attachment to the SOP; and
- Do not disturb waste or other materials labeled "Danger - Asbestos Fibers."

Subcontractors performing asbestos abatement activities are required to obtain state or special licenses and permits and have a written compliance/abatement plan that has been reviewed and accepted by CH2M HILL before work begins. Subcontractors are required to provide proof that all asbestos workers medically qualified, training and a competent person has been appointed before work begins.

## 8.6 Benzene

(Reference CH2M HILL SOP HSE-503, *Benzene*)

Benzene is considered a “Confirmed Human Carcinogen.” CH2M HILL is required to control employee workplace exposure to benzene when personal exposures is at or above 0.5 parts per million (ppm) as an 8-hour time-weighted average (TWA) or above 5.0 ppm short term exposure limit (STEL), by implementing a program that meets the requirements of the OSHA Benzene standard, 29 CFR 1910.1028. The elements of the CH2M HILL benzene program include the following:

- Exposure monitoring;
- Methods of control, including personal protective equipment (PPE) and respirators;
- Medical surveillance;
- Training on hazards of benzene and control measures (includes project-specific training and the computer-based training on CH2M HILL’s Virtual Office, *Benzene*); and
- Record keeping requirements.

If air monitoring indicates there is potential exposure at the action level concentrations above, notify the RHSM to ensure the above have been adequately addressed. Other exposure control measures include:

- Do not enter regulated work areas unless training, medical monitoring, and PPE requirements established by the competent person have been met;
- Do not eat, drink, smoke, chew tobacco or gum, or apply cosmetics in regulated areas;
- Respiratory protection and other exposure controls selection shall be based on the most recent exposure monitoring results obtained from the competent person; and
- Review the fact sheet included as an attachment to the SOP.

## 8.7 Cadmium

(Reference CH2M HILL SOP HSE-504, *Cadmium*)

Cadmium is considered a “Suspected Human Carcinogen.” CH2M HILL is required to control employee workplace exposure to cadmium when personal exposure is at or above 2.5 micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ ) by implementing a program that meets the requirements of the OSHA Cadmium standard, 29 *Code of Federal Regulations* (CFR) 1926.1127. The elements of the CH2M HILL cadmium program include the following:

- Exposure monitoring;
- Methods of control, including PPE and respirators;
- Medical surveillance;
- Training on hazards of cadmium and control measures (includes project-specific training and the computer-based training on CH2M HILL’s Virtual Office, *Cadmium*); and
- Recordkeeping requirements.

If air monitoring indicates there is potential exposure at the action level concentrations above, notify the RHSM to ensure the above have been adequately addressed. Other exposure control measures include:

- Do not enter regulated work areas unless training, medical monitoring, and PPE requirements established by the competent person have been met;
- Do not eat, drink, smoke, chew tobacco or gum, or apply cosmetics in regulated areas;
- Respiratory protection and other exposure controls selection shall be based on the most recent exposure monitoring results obtained from the competent person; and
- Review the fact sheet included as an attachment to the SOP.

## 8.8 Chainsaws

(Reference CH2M HILL SOP HSE-210, *Hand and Power Tools*)

Below are the hazard controls and safe work practices to follow when working around or operating chainsaws. Ensure the requirements in the referenced SOP are followed.

### 8.8.1 Equipment

Only chainsaws equipped with a spark arrestor and fully functioning chain brake or “safety chain” shall be used. The following safety equipment shall be readily available while operating a chainsaw:

- Chainsaw operator’s manual;
- Fully stocked first aid kit;
- Multipurpose fire extinguisher;
- Grounded extension cord approved for outdoor use and ground fault circuit interrupter (GFCI) for electrical-powered chainsaws;
- Approved safety gasoline container and funnel or flexible nozzle for refueling gasoline-powered chainsaws; and
- Sledge hammer and non-metallic wedges when necessary to prevent pinching of the chain.

### 8.8.2 PPE Requirements

The following personal protective equipment shall be worn while operating chainsaws:

- Safety glasses with side shields and face shield to prevent injury from wood chips, sawdust, or other flying objects;
- Hard hat with properly fitted suspension to prevent head injury from falling debris;
- Steel-toed safety shoes or boots to prevent foot injury from falling objects and accidental contact with the moving chain;
- Hearing protection to prevent permanent damage to hearing. Ear muffs or plugs will have a decibel noise reduction rating (NRR) assigned to them. The higher the rating, the greater the protection offered;
- Non-leather, fabric work gloves to prevent hand injury from abrasions, splinters and cuts;
- Clothing that is well-fitted and free of loose edges that could become entangled in the saw; and
- Protective chaps or leggings that cover the area from the groin to about 2 inches (5.08 cm) above the ankles should be used. These chaps are made from synthetic fabrics that are designed to prevent the running saw chain from coming in contact with your legs.

### 8.8.3 Safe Operation

The following safe operation guidelines shall be followed regardless of the purpose for using a chainsaw:

- Inspect the chainsaw prior to use;
- Chainsaws shall be held firmly with both hands, with thumbs and fingers encircling both chain saw handles;
- Stand slightly to the left side of the saw, out of the plane of the cutting chain and guide bar to reduce the risk of injury in the event of a kickback;
- Position saw so that it is between the waist and mid-chest level. Overreaching or cutting above the mid-chest height shall be avoided;
- Maintain a full throttle setting while cutting. Chainsaws are designed to be run at full speed;
- Always be aware of what is in the saw's downward path after the cut;
- Do not attempt to cut material that is larger than the guide bar of the saw;
- Avoid cuts that will cause the chainsaw to jam. Always cut into the compression wood first until the cut starts to close; then cut from the other side toward the compression cut;
- Use a non-metallic wedge to prevent the compression cut jamming on the blade;
- Chainsaws are designed to feed themselves into the wood and require only light pressure to cut efficiently. If extra force is required to keep cutting, the chain requires sharpening. Additional signs of a dull chain include a saw that is cutting crooked, results in fine sawdust instead of chips, or the smell of burnt wood. Do not use a dull chain;
- Bystanders and helpers shall be kept at a safe distance from operation;
- Do not operate a chainsaw when fatigued; take frequent breaks;
- Work slowly; don't rush; and
- A fire extinguisher shall be present at all times when operating the chainsaw in forest or brushy areas.

### 8.8.4 Refueling the Engine

The fuel for gasoline-powered chainsaws shall be mixed in accordance with the manufacturer's recommendations as outlined in the chainsaw operator's manual. Fuel shall be stored and transported in an approved safety container. The following precautions should also be followed:

- The engine shall be shut off and allowed to cool before refueling; never refuel a hot engine;
- A fire extinguisher shall be present during fueling and refueling;
- Smoking around fueling or refueling operations shall be prohibited; and
- A funnel or a flexible nozzle shall be used to avoid spilling fuel on the engine.

## 8.9 Chemical Injections

When the remedial action objectives for a project include subsurface injection of chemicals, the procedures and handling practices identified below must be implemented.

### Pre-Injection

Review the Safety Data Sheets (SDSs) for the materials which are expected to be utilized in the chemical injection processes for this contract task order and:

- Document training in accordance with the Hazard Communication section of these Guidelines.
- Ensure that appropriate spill response materials are present (e.g., absorbent media for oil, neutralizing agents for potassium permanganate, secondary containment for larger chemical tanks).



Evaluate potential for “daylighting” of chemical injection in the work area:

- Evaluation should identify known or potential pathways such as existing monitoring wells screened at the same depth interval as the planned injection, wells that were not properly abandoned, and utility corridors.
- Identify potential surface release areas such as nearby sensitive areas (e.g., wetlands) storm drains, ditches, or streams, and ensure that mitigation measures are in place (e.g., temporarily blocking storm sewer drains).
- Contact the project Environmental Manager for assistance in identifying release scenarios and mitigation measures.

### **Injection Operations**

- Operate and maintain pressure vessels, pumps and hosing in accordance with the manufacturer’s recommendations.
- Do not exceed the rated pressure of the vessels and associated piping or hoses of the system.
- The system must be provided with a pressure relief valve/controller that safely reduces the system pressure to within the system rated pressure.
- The pressure relief valve must be rated at no more than 110 percent the rated pressure of the system and must be tested at regular intervals.
- Each vessel must be equipped with a functioning pressure gauge to monitor pressure.
- For PPE and air monitoring requirements, refer to the PPE section and Site Monitoring section of the project safety plan. PPE shall be used to minimize potential exposure to identified site contaminants of concern and injection solutions during site injection operations. In addition, good personal hygiene practices and procedures must be practiced.
- Use face shields in combination with safety glasses or goggles when the potential for exposure to chemical splashes may exist.
- If repairs to injection delivery system components are necessary after the subsurface injection operations have been initiated, the injection lines must be relieved of pressure and drained before conducting repair work. See also the Lockout/Tagout section of these Guidelines.
- Drums/containers of injection material shall be moved using a drum “dolly” or other appropriate material handling equipment where the weight of the drum can be properly managed and secured during the movement.
- Empty containers may require special preparation/rinsing prior to disposal. Verify requirements with the project Environmental Manager.
- Only qualified personnel, by prior training or experience, may operate the injection system delivery components/array(s).
- Appropriate spill response materials for all chemicals must be present at the job site. Only qualified (by training and previous experience) who have proper PPE and equipment available shall provide spill response operations.
- Station a portable eye wash in the immediate work area where chemical injections are occurring, along with wash facilities for hygienic practices and PPE decontamination.
- If PPE becomes saturated and may potentially impact work clothing, dermal surfaces, or mucous membranes, change PPE immediately.
- Verify the competency and integrity of the chemical injection hoses/piping and connection points
- Confirm hose/piping rated for 100 psi.

- Verify the any cam-lock fitting on the injection hose/piping, well head, or direct push technology (DPT) rods are structurally sound and free of defects. Where hoses are used, ensure fittings have been secured to the hose surface via mechanical banding equipment to prevent whipping.
- When injecting under pressure, stand at a sufficient distance (i.e., ~ 20 feet) from the injection well head/point. Keep unessential project personnel away from the injection system, array, and well head(s) during injection operations.
- Remove/stow all unnecessary equipment and material in the area.
- The injection system/array must be monitored/attended at all times during the injection process and when not in use, components must be properly secured, de-energized, or stowed. If the system will operate without an attendant, plans for operating unattended must be in place and approved by the PM and HSM/EM.
- All pressured lines and fittings should be 'tethered' or otherwise secured to minimize whipping or 'launching' of lines in the event of an equipment failure. Any "quick connect" type fittings (compressed air or fluid) should be secured with appropriate pins, clips to prevent accidental disengagement of the fitting during operation.
- Inspect all equipment, hoses, pressure lines, and fittings daily and prior to pressurizing.

### Chemical Storage

- Some injection chemicals, such as strong oxidizers, may have stringent storage requirements per local or National Fire Codes. Verify that appropriate storage provisions are in place prior to starting work.
- NOTE: Counties and cities may have requirements specific to storing these chemicals. Also, storage and use of certain chemicals such as potassium permanganate and hydrogen peroxide may be subject to the new Chemical Facility Anti-Terrorism Standards of the Department of Homeland Security – the applicability depends on the chemical, quantity/concentration, and type of facility. Please contact the project Environmental Manager to determine whether chemicals are subject to these standards.
- Chemicals must be stored in a designated, secured area with spill prevention capabilities. Review SDS or other information to determine potential incompatible materials. Incompatible materials shall not be stored together. Ensure all containers are labeled.

## 8.10 Compressed Gas Cylinders

(Reference CH2M HILL SOP HSE-403, *Hazardous Materials Handling*)

Below are the hazard controls and safe work practices to follow when working around or using compressed gas cylinders. Ensure the requirements in the referenced SOP are followed.

- Cylinders and pressure-controlling apparatus shall be inspected for defects and leakage prior to use. Damaged or defective items shall not be used. If a cylinder is found to be defective, the gas distributor shall be notified and subsequent instructions followed. If a leak should develop at a fuse plug or other safety device, the cylinder shall be removed from the work area.
- Cylinders shall be labeled with the identity of the contents. Cylinders not labeled shall be sent back to the cylinder distributor. The color of the cylinder shall not be used exclusively to identify cylinder contents.
- Valve caps must be in place when cylinders are transported, moved, or stored.
- Cylinders must be secured in an upright position at all times.
- Cylinder valves must be closed when cylinders are not being used and when cylinders are being moved.
- Cylinders must be secured on a cradle, basket, or pallet when hoisted; they may not be hoisted by choker slings.
- Eye protection (safety glasses or goggles) shall be worn when using cylinders.

- Cylinders must be shielded from welding and cutting operations and positioned to avoid being struck or knocked over; contacting electrical circuits; or exposed to extreme heat sources.
- Cylinders inside buildings shall be stored in dry, well-ventilated locations at least 20 feet (6.1 meters) from highly combustible materials. Cylinders should be stored in definitely assigned places away from elevators, stairs, or gangways. Assigned storage areas shall be located where cylinders will not be knocked over or damaged.
- Oxygen cylinders in storage shall be separated from fuel gas cylinders or combustible materials by a minimum of 20 feet (6.1 meters) or by a noncombustible barrier at least 5 feet (1.5 meters) high, having a fire resistance rating of at least 0.5 hour.
- Signs indicating no smoking shall be provided for storage areas containing flammable gas cylinders.
- Complete the self-assessment checklist for compressed gas cylinders are being used.

## 8.11 Concrete Work and Masonry Construction Activities (Including well pad construction)

(Reference CH2M HILL SOP HSE-302, *Concrete and Masonry*)

Below are the hazard controls and safe work practices to follow when working around or performing concrete and masonry activities. Ensure the requirements in the referenced SOP are followed.

- Wear PPE to avoid contact with concrete including gloves, mud boots, hard hat, safety glasses, long sleeved shirt and long pants.
- Consult the glove supplier or the cement manufacturer's SDS for help in choosing the proper gloves. Butyl or nitrile gloves (rather than cotton or leather gloves) are frequently recommended for caustic materials such as Portland cement.
- Use only well-fitting gloves. Loose-fitting gloves let cement in. Often the use of gloves and clothing makes exposure worse when cement gets inside or soaks through the garment. Use glove liners for added comfort.
- Wash your hands before putting on gloves. Wash your hands every time that you remove your gloves.
- Dry your hands with a clean cloth or paper towel before putting on gloves.
- Protect your arms and hands by wearing a long sleeve shirt with the sleeves duct-taped to your gloves to prevent wet cement from getting inside the gloves.
- Follow proper procedures for removing gloves, whether reusing or disposing them.
- Clean reusable gloves after use. Before removing gloves, clean the outside by rinsing or wiping off any wet cement. Follow the manufacturer's instructions for glove cleaning. Place clean and dry gloves in a plastic storage bag and store them in a cool, dry place away from tools.
- Throw out grossly contaminated or worn-out gloves.
- Keep the inside of gloves clean and dry.
- Wear waterproof boots when necessary to prevent wet cement from coming into contact with your skin. It is as important to protect your legs, ankles, and feet from skin contact with wet cement as it is to protect your hands.
- Boots need to be high enough to prevent wet cement from getting inside. Tuck pants inside and wrap duct tape around the top of the boots to prevent wet cement from entering.
- Change protective boots if they become ineffective or contaminated on the inside with wet cement while in use.

- Change out of any work clothes that become contaminated with wet cement and keep contaminated work clothes separate from your street clothes.
- When kneeling on wet cement use waterproof kneepads or dry kneeboards to prevent the knees from coming into contact with the cement.
- Wear proper eye protection when working with Portland cement.
- Perform hazard communication training for concrete. Read SDSs heed the manufacturers' recommendations for safety precautions.
- Protruding reinforcing steel (rebar), onto which personnel could fall, must be guarded to eliminate the hazard of impalement
- During post-tensioning, only those personnel essential to the operation are permitted behind the tensioning jacks.
- Personnel shall not ride concrete buckets nor position themselves in areas where buckets are lifted overhead.
- Personnel shall maintain a safe distance from formwork and shoring being removed from concrete structures.
- Personnel shall maintain a safe distance from precast and lift-slab concrete being lifted into position until physically secured.
- Personnel shall not enter limited access zones during masonry wall construction.
- When CH2M HILL is in control of concrete and masonry operations, a lift slab competent person will oversee all the concrete and masonry operations.
- Complete the self-assessment checklist for concrete and masonry activities whenever those activities are being performed.

## 8.12 Concrete Core Drilling

(Reference CH2M HILL SOP HSE-204, *Drilling*)

Below are the hazard controls and safe work practices to follow when working around or performing concrete core drilling.

- Operators must read and understand the Operators Manual(s) for the equipment that will be used.
- Follow all manufacturers' operating instructions and comply with all warning labels on the equipment.
- Inspect equipment to ensure it is in proper operating condition prior to use. Equipment damage or missing parts must be corrected prior to operation.
- Follow all requirements for use of PPE. Minimum PPE includes hearing protection, safety glasses with side shields, safety toed boots. A face shield over safety glasses or liquid splash goggles may be required for wet coring.
- Inspect areas to be cored to ensure there are no obstructions, for example utilities on the opposite side of a wall to be cored through. Follow utility locate procedures for when coring slab on grade.
- Provide dust control (wet coring or local exhaust for dry coring) to avoid potential silica exposure.
- Make sure that all electrical wiring is grounded.
- The power supply line (electric cord, pneumatic or hydraulic line) must be protected from damage and routed to prevent it becoming a tripping hazard.
- When hydraulic coring equipment is used, all workers must be aware of hydraulic lines running to the coring equipment. Preparations must be made for containment/clean up in the event of a ruptured hydraulic line.

- All workers must keep their hands and body away from the cutting saw/cable.
- The power supply must be disconnected when changing bits or conducting other maintenance on the equipment.
- Slippery conditions may exist in wet coring operations. Water needs to be controlled during cutting and proper safety toed footwear used to minimize slip potential.
- Use the Drilling Self-Assessment checklist to evaluate coring operations.

## 8.13 Concrete Saw Cutting

- Ensure operators are trained and familiar with the equipment are operating the saw. Operators must read and understand the Operators Manual(s) for the equipment that will be used.
- Inspect equipment to ensure it is in proper operating condition prior to use. Equipment damage or missing parts must be corrected prior to operation.
- Cutting blades shall be the correct size, installed properly, guarded at all times, and speed should not exceed the manufacturer's suggested operating speed.
- Workers shall use the correct blade for the job and inspect it for defects before each use.
- Saws shall be maintained and kept clean from dust build-up. Workers shall not push against the saw during operation to avoid the blade jumping out of the cutting path and loss of operator control.
- Inspect areas to be sawed to ensure there are no obstructions, for example rocks or other debris. Follow utility locate procedures prior to cutting.
- Personal protective equipment (PPE) saw use shall include hard hats, safety-toed boots, safety glasses and face shields, hearing protection, and leather gloves.
- The dust created by the concrete saw needs to be controlled using the application of water or local exhaust ventilation (i.e., removes dust at the source) to reduce the amount of airborne dust generated. If dust cannot be controlled, suspend work and contact the RHSM to determine if air monitoring/respiratory protection will be necessary.
- If equipped, the power supply line (electric cord, pneumatic or hydraulic line) must be protected from damage and routed to prevent it becoming a tripping hazard. The power supply must be disconnected when changing blades or conducting other maintenance on the equipment.
- Ensure all utilities have been marked and located in accordance with the underground utilities section of these Guidelines.
- Slippery conditions may exist in wet cutting operations. Water needs to be controlled during cutting and proper safety toed footwear used to minimize slip potential.

## 8.14 Confined Space Entry Activities

(Reference CH2M HILL, SOP HSE-203, *Confined Space Entry*)

A confined space is defined as a space that has all of the following characteristics:

- Large enough to allow personnel to enter the space with their entire body;
- Limited openings for entry and exit; and
- Not designed for continuous human occupancy;

Examples of possible confined spaces include underground vaults, pipelines, ducts, tunnels, storage tanks, sewers, process vessels, and pits. Entry into a confined space is defined as breaking the plane of a confined space with any part of the body.

The following requirements apply when entering a permit-required confined space (PRCS), an Alternate Procedure Confined Space, or a PRCS reclassified as a non-permit confined space (NCS). Ensure the requirements in the referenced SOP are followed.

- Entrants, Attendants, and the Entry Supervisor shall have successfully completed Confined Space Entry training.
- The appropriate confined space entry permit shall be completed as outlined in CH2M HILL SOP HSE-203, *Confined Space Entry*.
- The completed permit or certificate shall be posted for review near the space entrance point.
- The Entry Supervisor shall conduct a pre-entry briefing with all Authorized Entrants and Attendants prior to entry in accordance with SOP HSE-203.
- Entrants and Attendants shall verify that the Entry Supervisor has authorized entry and that all requirements of the permit or certificate have been satisfied prior to each entry.
- Atmospheric monitoring for oxygen, combustible gases, and potential toxic air contaminants shall be conducted at the frequency provided on the permit or certificate. Entry shall not be permitted if an atmospheric hazard is detected above acceptable safe levels. Atmospheric monitoring shall be performed in accordance with the Site Monitoring Section of the project safety plan and SOP HSE-203.
- Entrants shall evacuate the space upon orders of the Attendant or Entry Supervisor, when an alarm is sounded, or when a prohibited condition or dangerous situation is recognized.
- Entrants and Attendants shall inform the Entry Supervisor of any hazards confronted or created in the space, or any problems encountered during entry. The Entry Supervisor shall inform the owner of such issues.
- The Entry Supervisor shall provide a copy of the canceled permit or certificate to the SC for review and maintain it in the project file.
- Complete the self-assessment checklist for confined space entry whenever entries are being performed.

## 8.15 Cranes

(Reference CH2M HILL SOP HSE-303, *Cranes*)

Below are the hazard controls and safe work practices to follow when working around or operating cranes. Ensure the requirements in the referenced SOP are followed.

- Crane operators are prohibited from using any wireless device while operating a crane. Equipment must be stopped before using devices such as two way radios or cell phones. If a wireless device is required for a certain operation, the PM and HSM must authorize the wireless use on a case by case basis and make sure limitations are addressed in the project safety plan.
- Cranes shall be operated by a certified crane operator. After November 10, 2014, only operators possessing a certificate from a nationally accredited testing organization, an audited employer training program, or U.S. military or state-issuing agency will be authorized to operate cranes.
- The crane's operations manual and load chart specifically designed for the crane shall be in the crane at all times.
- The crane must have a current annual inspection to include load test certification (within the last 12 months) that meets all state and federal safety standards. Documentation of this inspection must be available for review.
- A competent person will inspect the crane daily to ensure it is in safe operating condition. The daily crane inspection log provided within the crane manufacturer's operations manual shall be used. See also the requirements for monthly inspections, among others, in SOP HSE-303.

- All rigging equipment must be inspected by a competent person prior to use for signs of excessive wear; equipment found to be damaged will be tagged and removed from service.
- A qualified and competent Assembly/Disassembly (A/D) Director shall be assigned when cranes must be assembled onsite. The A/D Director is responsible for ensuring the crane is assembled and disassembled according to manufacturer requirements; performing training for the A/D crew; and ensuring sufficient ground conditions exist for crane placement; among other responsibilities (see SOP HSE-303).
- The assembly/disassembly process must comply with requirements in HSE-303, including having an AHA for the task.
- A critical lift plan shall be prepared when the lift is estimated to be greater than 75 percent of the crane capacity or when two cranes will be used to make a lift.
- A pre-lift meeting will be conducted to include all parties involved in that day's crane operation.
- Only one qualified person shall be designated to signal the crane operator. This person shall be thoroughly familiar with the ANSI standard method of hand signals and an illustration of these signals shall be posted at the job site.
- No personnel shall be permitted under the load at any time.
- Tag lines shall be attached to every load being made by the crane.
- The swing radius of the rear rotating superstructure (counterweight) of the crane shall be barricaded and no entrance allowed.
- Suspended loads shall not pass over workers or occupied buildings at any time.
- Complete the self-assessment checklist for crane-suspended personnel platforms whenever they are being used.
- CH2M HILL employees exposed to hazards posed by crane operations, must be trained in hazards awareness and control procedures. See requirements for training in HSE-303.

### **Power Line Safety**

It must be determined whether equipment operations including assembly/disassembly, positioning, and crane operation (including traveling with a load) will occur in proximity to power lines within 20 feet (6.1 meters) for line voltage up to 350 kilo volts (kV), and within 50 feet (15.2 meters) for line voltage between 350 kV to 1000 kV. For power lines over 1000 kV, the distance must be determined by the utility/operator or qualified registered professional engineer in electrical power transmission and distribution.

If equipment operations are within proximity of aforementioned distances to power lines, one of the following options must be implemented to prevent encroachment and electrocution:

- Option 1: Deenergize and ground the power. Confirm from the utility/operator that the power line has been deenergized and visibly grounded at the worksite
- Option 2: If the voltage is not determined, ensure that no part of the equipment, load line, or load (including rigging and lifting accessories), gets closer than 20 feet (6.1m) by:
  - Conduct a planning meeting with the operator and other workers in the area to review the actions that will be taken to prevent encroachment and electrocution. Training requirements for working around energized power lines are described in Section 6.0, Training.
  - Use non-conductive tag lines.
  - Erect and maintain an elevated warning line, barricade or line of signs in view of the operator, either with flags or other high-visibility markings at 20 feet (1.6m) from the power line. A spotter must be used when the operator does not have clear line of sight to the elevated warning line.

- To prevent encroachment, the operator can use a proximity alarm, or position a dedicated spotter with visual aids to demarcate the encroachment and constant communication access to the operator.

If the line voltage can be determined, and if any part of the equipment, line load or load (including rigging and lifting accessories) would encroach within that specified distance listed in Table 1, then the requirements listed in Option 2 must be implemented.

TABLE 1  
**Minimum Clearance Distances**

Voltage (nominal, kV, alternating current)	Minimum Clearance – Feet (meters)
Up to 50	10
Over 50 to 200	15
Over 200 to 350	20
Over 350 to 500	25
Over 500 to 750	35
Over 750 to 1000	45
Over 1000	Established by the utility owner/operator or by a qualified registered professional engineer in electrical power transmission and distribution

For equipment traveling within 20 feet (6.1m), under or near power lines without a load, the clearance distances described in Table 2 must be maintained and the following actions implemented.

- A dedicated spotter is assigned during equipment travel, positioned to effectively gauge the clearance distance, and is in continuous communication with the operator.
- During equipment travel, the boom/mast and support system are sufficiently lowered to ensure clearance distances are maintained, along with taking into consideration of the effects of speed and terrain.

TABLE 2  
**Minimum Clearance Distances While Traveling With No Load**

Voltage (nominal, kV, alternating current)	Minimum Clearance – Feet (meters)
Up to 0.75	4
Over 0.75 to 50	6
Over 50 to 345	10
Over 345 to 750	16
Over 750 to 1000	20
Over 1000	Established by the utility owner/operator or by a qualified registered professional engineer in electrical power transmission and distribution



## 8.16 Crystalline Silica

(Reference CH2M HILL SOP HSE-511, Crystalline Silica)

CH2M HILL subcontractors shall control employee exposure to crystalline silica when exposures are at or above the ACGIH TLV of 0.025 mg/m<sup>3</sup> by submitting for review and approval a crystalline silica exposure monitoring plan. The elements of an exposure monitoring plan include, but are not limited to the following:

- A bulk sample representative of the material to be demolished must be sent with the air monitoring sample media for analysis;
- Initial monitoring and personal air sampling must be conducted to determine the potential worker exposure to respirable crystalline silica;
- Real-time particulate monitors with a 10 micron respirable size fraction attachment may be used as part of the initial and ongoing monitoring plan to evaluate the potential worker exposure. This must include an action level established by their corporate or site health and safety professional and include actions required (e.g., implement engineering, administrative controls, respiratory protection);

Other exposure control measures include:

- Maintaining surfaces as clean as practicable to minimize accumulation of crystalline silica containing particulate material;
- Clean surfaces with a HEPA-filter vacuum or equivalent method;
- Implement dust suppression during demolition;
- Restricting access to the work area where crystalline silica exposure may exist to only those authorized to perform work or enter the area;
- Do not eat, drink, smoke, chew tobacco or gum, or apply cosmetics in these areas;
- Respiratory protection and other exposure controls selection shall be based on the most recent exposure monitoring results obtained from the competent person; and

## 8.17 Demolition

(Reference CH2M HILL SOP HSE-305, *Demolition*)

This section is applicable to all forms of demolition. Demolition is defined as the removal or dismantling of structures or equipment by disassembly.

An engineering survey shall be completed prior to start of demolition operations. The survey shall determine the condition of the structure framing, floors, and walls; the presence of asbestos, polychlorinated biphenyls (PCBs), lead paint, or other regulated hazardous substances; the presence of hazardous materials in tanks, pipes, and equipment; and the possibility of unplanned collapse of any portion of the structure. Any adjacent structure where personnel may be exposed shall also be similarly evaluated. The survey shall be conducted by a competent person and a written record of the survey findings shall be maintained at the project site.

The demolition contractor working on this project will provide CH2M HILL with a demolition safety plan prior to the start of work. CH2M HILL will use this plan to verify that the subcontractor is implementing the necessary safety precautions during this activity. In addition, the following safety precautions shall be implemented by CH2M HILL personnel. Below are the hazard controls and safe work practices to follow when working around or performing demolition. Ensure the requirements in the referenced SOP are followed.

- Appropriate warning and instructional safety signs shall be conspicuously posted where necessary.
- Fugitive dust must be controlled during demolition by using water spray or other methods.

- Remain a safe distance from the demolition zone to reduce exposure to fragmentation of glass, steel, masonry, and other debris during demolition operations.
- Do not enter the demolition zone unless completely necessary, and only after the competent person has assessed the condition of the structure and has authorized entry.
- Follow all requirements established by the competent person. The competent person shall inform personnel of the areas that are safe to enter and the areas where entry is prohibited. When possible, the competent person should escort CH2M HILL personnel while in the demolition zone.
- All demolition activities that may affect the integrity of the structure or safety of personnel must cease until personnel have exited the demolition zone.
- During the course of demolition, work areas, passageways, stairs, ladders, and exits shall be kept free of demolition debris.
- Stay as clear as possible of all hoisting operations. Loads shall not be hoisted overhead of personnel
- Proper control measures shall be in place before welding or cutting on surfaces covered by coatings containing flammable or hazardous materials such as lead, cadmium, zinc, etc. Highly flammable or toxic coatings may require stripping of the coating a sufficient distance from the area to be heated. Welding and cutting shall be performed in accordance with the provisions of OSHA 1926, Subpart J, "Welding and Cutting." Follow "Welding and Cutting" SOP HSE-314.

The following lead-exposure-control procedures will be implemented during demolition operations involving potential exposure to lead:

- Site personnel will be provided lead-awareness training;
- Site personnel will be provided with hand-washing facilities and will wash their hands daily;
- An excavator equipped with hydraulic shears will be used only to cut painted wooden, concrete, and metal structures;
- Neither hand-held band/chop saws nor torch cutting equipment will be used on painted surfaces without proper PPE and engineering controls in place or removal of paint prior to cutting;
- During all demolition operations to control potential exposures to LBP, wet methods using water mist will be used;
- A direct-reading dust monitor will be used to monitor demolition operations that pose a potential lead-exposure hazard (that is, those with an action level requiring that additional dust control measures be employed and/or that respiratory protection be used.);
- Personal air samples will be collected and analyzed for lead to confirm that no personnel are exposed to levels above the lead action level of 30 micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ ); and
- The selection of respiratory protection and other exposure controls will be based on the most recent exposure monitoring results obtained from the lead-exposure-competent person.
- For more information see CH2M HILL SOP HSE-508, Lead.

## 8.18 Drilling Safety

(Reference CH2M HILL SOP HSE-204, *Drilling*)

Below are the hazard controls and safe work practices to follow when working around or performing drilling. Ensure the requirements in the referenced SOP are followed.

- The drill rig is not to be operated in inclement weather.

- The driller is to verify that the rig is properly leveled and stabilized before raising the mast.
- Personnel should be cleared from the sides and rear of the rig before the mast is raised.
- The driller is not to drive the rig with the mast in the raised position.
- The driller must check for overhead power lines before raising the mast. Maintain a minimum distance of 10 feet (3 meters) between mast and overhead lines (<50 kV) and an additional 0.4 inches for every 1 kV over 50kV. Verify the voltage of nearby overhead power lines to determine the minimum distance.
- If the project site is suspected of munitions or explosives of concern (MEC) contamination, requirements of the *Explosives Usage and Munitions Response (MR) SOP HSE-610* shall be followed. MECs include unexploded ordnance (UXO), discarded military munitions, materials that present a potential explosive hazard, chemical warfare materials, munitions constituents, and contaminated soil or groundwater. “Down-hole” avoidance support may be required to prevent accidental contact with UXO. Safety requirements will be based on the risk assessment identified within the MR (safety) ORE (Opportunity Risk Evaluation).
- Personnel should stand clear before rig startup.
- The driller is to verify that the rig is in neutral when the operator is not at the controls.
- Become familiar with the hazards associated with the drilling method used (cable tool, air rotary, hollow-stem auger, etc.).
- Do not wear loose-fitting clothing, watches, etc., that could get caught in moving parts.
- Do not smoke or permit other spark-producing equipment around the drill rig.
- The drill rig must be equipped with a kill wire or switch, and personnel are to be informed of its location.
- Be aware and stand clear of heavy objects that are hoisted overhead.
- The driller is to verify that the rig is properly maintained in accordance with the drilling company’s maintenance program.
- The driller is to verify that all machine guards are in place while the rig is in operation.
- The driller is responsible for housekeeping (maintaining a clean work area).
- The drill rig should be equipped with at least one fire extinguisher.
- If the drill rig comes into contact with electrical wires and becomes electrically energized, do not touch any part of the rig or any person in contact with the rig, and stay as far away as possible. Notify emergency personnel immediately.
- Use the drilling self-assessment checklist to evaluate drilling operations.

## 8.19 Drum and Portable Tank Handling

Below are the hazard controls and safe work practices to follow when overseeing the movement of drums or when handling drums:

- Ensure that personnel are trained in proper lifting and moving techniques to prevent back injuries;
- Ensure drum or tank bungs and lids are secured and are labeled prior to moving;
- Ensure that drums and tanks remain covered except when removing or adding material or waste. Covers and/or lids will be properly secured at the end of each workday;
- Provide equipment to keep the operator removed from the drums to lessen the likelihood of injury. Such equipment might include: a drum grappler attached to a hydraulic excavator; a small front-end loader, which

can be either loaded manually or equipped with a bucket sling; a rough terrain forklift; Roller conveyor equipped with solid rollers; drum carts designed specifically for drum handling;

- Make sure the vehicle selected has sufficient rated load capacity to handle the anticipated loads, and make sure the vehicle can operate smoothly on the available road surface;
- Ensure there are appropriately designed Plexiglas cab shields on loaders, backhoes, etc., when handling drums containing potentially explosive materials;
- Equipment cabs should be supplied with fire extinguishers, and should be air-conditioned to increase operator efficiency;
- Supply operators with appropriate respiratory protective equipment when needed;
- Ensure that drums are secure and are not in the operator's view of the roadway;
- Prior to handling, all personnel should be warned about hazards of handling;
- Before moving anything, determine the most appropriate sequence in which the various drums, portable tanks, and other containers should be moved (e.g., small containers may have to be removed first to permit heavy equipment to enter and move the drums);
- Overpack drums and an adequate volume of absorbent should be kept near areas where minor spills may occur;
- Use containers or overpacks that are compatible with the waste or materials;
- Drums containing liquids or hazardous waste will be provided with secondary containment and may not be located near a storm water inlet or conveyance;
- Allow enough aisle space between drum pallets and between drums and other equipment that the drums can be easily accessed (at least 2 to 3 feet) by fire control equipment and similar equipment.; and
- Make sure that a spill kit is available in drum or tank storage areas (or where liquids are transferred from one vessel to another).

## 8.20 Drum Sampling Safety

Personnel are permitted to handle and/or sample drums containing certain types of waste (drilling waste, investigation-derived waste, and waste from known sources) only. Handling or sampling drums with unknown contents requires a plan revision or amendment approved by the RHSM. The following control measures will be taken when sampling drums:

- Minimize transportation of drums;
- Sample only labeled drums or drums from a known waste stream;
- Do not sample bulging or swollen drums. Contact the RHSM;
- If drums contain, or potentially contain, flammable materials, use non-sparking tools to open;
- Use the proper tools to open and seal drums;
- Reseal bung holes or plugs whenever possible;
- Avoid mixing incompatible drum contents;
- Sample drums without leaning over the drum opening;
- Transfer/sample the content of drums using a method that minimizes contact with material;
- Use the PPE and perform air monitoring as specified in the PPE and Site Monitoring sections of the project safety plan;

- Take precautions to prevent contaminated media from contacting the floor or ground, such as having plastic under the sampling area, having a spill kit accessible during sampling activities; and
- If transferring/sampling drums containing flammable or combustible liquids, drums and liquid transfer equipment should be grounded and bonded to reduce the potential of a static discharge.

## 8.21 Earthmoving Equipment

(Reference CH2M HILL, SOP HSE-306, *Earthmoving Equipment*)

Below are the hazard controls and safe work practices to follow when working around or operating heavy equipment. Ensure the requirements in the referenced SOP are followed.

- CH2M HILL authorizes only those employees qualified by training or previous experience to operate material handling equipment.
- CH2M HILL employees must be evaluated prior to operating earthmoving equipment by a CH2M HILL earthmoving equipment operator evaluation designated person. This evaluation will be documented according to SOP HSE-306, Earthmoving Equipment.
- Heavy equipment operators are prohibited from using any wireless device while operating equipment. Equipment must be stopped before using devices such as two way radios or cell phones. If a wireless device is required for a certain operation, the PM and HSM must authorize the wireless use on a case by case basis and make sure limitations are addressed in the project safety plan.
- Equipment must be checked at the beginning of each shift to ensure the equipment is in safe operating condition and free of apparent damage. The check should include: service brakes, parking brakes, emergency brakes, tires, horn, back-up alarm, steering mechanism, coupling devices, seat belts and operating controls. All defects shall be corrected before the equipment is placed in service. Documentation of this inspection must be maintained onsite at all times (use the Earthmoving Equipment Inspection form if operated by CH2M HILL).
- Equipment must be on a stable foundation such as solid ground or cribbing; outriggers are to be fully extended.
- Equipment must not be used to lift personnel; loads must not be lifted over the heads of personnel.
- Equipment, or parts thereof, which are suspended must be substantially blocked or cribbed to prevent shifting before personnel are permitted to work under or between them. All controls shall be in a neutral position, with the motors stopped and brakes set.
- Equipment which is operating in reverse must have a reverse signal alarm distinguishable from the surrounding noise or a signal person when the operators view is obstructed.
- When equipment is used near energized power lines, the closest part of the equipment must be at least 10 feet (3 meters) from the power lines less than 50 kilovolts (kV). Provide an additional 4 feet (1.2 meters) for every 10 kV over 50 kV. A person must be designated to observe clearances and give timely warning for all operations where it is difficult for the operator to maintain the desired clearance by visual means. All overhead power lines must be considered to be an energized until the electrical utility authorities indicate that it is not an energized line and it has been visibly grounded.
- Underground utility lines must be located before excavation begins; refer to the Utilities (underground) section.
- Operators loading and unloading from vehicles are responsible for seeing that vehicle drivers are in the vehicle cab or in a safe area.

- The parking brake shall be set whenever equipment is parked; wheels must be chocked when parked on inclines.
- When not in operation, the blade or bucket must be blocked or grounded; the master clutch must be disengaged when the operator leaves the cab. When equipment is unattended, power must be shut off, brakes set, blades or buckets landed and shift lever in neutral.

## 8.22 Energized Electrical Work

(Reference CH2M HILL SOP HSE-221, *Energized Electrical*)

Energized electrical work is defined as work performed on or near energized electrical systems or equipment with exposed components operating at 50 volts or greater. Working near energized live parts is any activity inside a Limited Approach Boundary.

All electrical systems shall be considered energized unless lockout/tagout procedures are implemented and verified.

Electrical wiring and equipment shall be de-energized prior to conducting work unless it can be demonstrated that de-energizing introduces additional or increased hazards or is unfeasible due to equipment design or operational limitations. When energized electrical work is the only means that work can be performed, all requirements of SOP HSE-221 must be implemented including the following:

- Only qualified personnel are permitted to work on unprotected energized electrical systems. These personnel shall complete the CH2M HILL energized electrical safety training and must be designated by their supervisor as an Energized Electrical Qualified Person (EEQP). CPR and AED training must be completed by these personnel annually.
- An Electrical Hazard Analysis must be performed to identify energized electrical safe work practices before any person approaches exposed live parts within the Limited Approach Boundary (as determined by the shock hazard analysis), by performing both shock hazard analysis and flash hazard analysis, which comprise the electrical analysis.
- The Energized Electrical Work Permit must be completed prior to working on unprotected energized electrical systems.
- CH2M HILL employees designated as qualified persons working on live parts of energized electrical systems 480 volts and above shall implement the buddy system. This means that two EEQPs must be engaged in this work. Working on live parts of energized electrical systems 480 volts and above means actual contact with live parts or working within the Prohibited Approach Boundary, which is one inch (2.54 cm) for 480 volt systems.
- The buddy system requires the presence of an additional EEQP who shall stand by and render assistance, or summon help for the first person, in the event the first person is inadvertently shocked while performing the work. The second person shall not be assigned to additional distracting duties or tasks while the energized electrical work is being performed and shall know the location of the isolation device(s) for the equipment being worked on.
- Workers designated as qualified persons shall wear the required electric shock and arc-flash PPE, as specified by the qualified person responsible for the energized electrical operations.
- Safety signs, safety symbols or accident prevention tags, meeting applicable American National Standards Institute (ANSI) Standards, shall be used where necessary to warn employees about electrical hazards.
- Barricades shall be used in conjunction with safety signs where it is necessary to prevent or limit employee access to work areas containing live parts. Conductive barricades shall not be used where it may cause an electrical hazard. Barricades shall be placed no closer than the Limited Approach Boundary.

- If signs and barricades do not provide sufficient warning and protection from electrical hazards, an attendant shall be stationed to warn and protect unqualified employees. The primary duty and responsibility of an attendant providing manual signaling and alerting shall be to keep unqualified employees outside a work area where the unqualified employee might be exposed to electrical hazards. An attendant shall remain in the area as long as there is a potential for employees to be exposed to the electrical hazards.
- Employees shall not perform tasks near exposed energized parts where lack of illumination or an obstruction precludes observation of the work. Employees shall not reach blindly into areas that may contain energized parts.
- Work shall be performed in accordance with National Fire Protection Association (NFPA) 70E requirements (2012 edition).
- Follow all control measures and procedures identified on the Energized Electrical Work Permit and the AHA.

## 8.23 Excavation Activities

(Reference CH2M HILL SOP HSE-307, *Excavation and Trenching Safety*)

The requirements in this section shall be followed whenever excavation is being performed. Refer to the Earthmoving Equipment section and SOP for additional requirements applicable to operating/oversight of earthmoving equipment. Below are the hazard controls and safe work practices to follow when working around or performing excavation. Ensure the requirements in the referenced SOP are followed.

- If the project site is suspected of munitions or explosives of concern (MEC) contamination, requirements of the *Explosives Usage and Munitions Response (MR)* SOP HSE-610 shall be followed. MECs include unexploded ordnance (UXO), discarded military munitions, materials that present a potential explosive hazard, chemical warfare materials, munitions constituents, and contaminated soil or groundwater. “Down-hole” avoidance support may be required to prevent accidental contact with UXO. Safety requirements will be based on the risk assessment identified within the MR (safety) ORE (Opportunity Risk Evaluation).
- Do not enter the excavations unless completely necessary, and only after the excavation competent person has completed their daily inspection and has authorized entry. An inspection shall be conducted by the competent person prior to the start of work, as needed throughout the shift, after every rainstorm, and after any hazard increasing occurrence. Documentation of the inspection must be maintained onsite at all times.
- Follow all excavation entry requirements established by the excavation competent person and any excavation permit being used.
- Sloping, benching, shoring, shielding, or other protective systems are required to protect personnel from cave-ins except when the excavation is made entirely in stable rock or is less than 5 feet deep (1.5 meters) and there is no indication of possible cave-in, as determined by the excavation competent person. Protective systems for excavations deeper than 20 feet (6.1 meters) must be designed or approved by a registered professional engineer.
- Trenches greater than 4 feet (1.2 meters) deep shall be provided with a ladder, stairway, or ramp positioned so that the maximum lateral travel distance is no more than 25 feet (7.6 meters).
- The atmosphere of excavations greater than 4 feet (1.2 meters) deep shall be tested prior to entry when a hazardous atmosphere exists or could reasonably be expected to exist, such as excavating landfills, hazardous waste dumps; or areas containing sewer or gas utility systems, petroleum distillates, or areas where hazardous substances are stored nearby.
- Spoil piles, material, and equipment must be kept at least 2 feet (61 centimeters) from the edge of the excavation, or a retaining device must be used to prevent the material from falling into the excavation.

- Excavations shall not be entered when:
  - Protective systems are damaged or unstable;
  - Objects or structures above the work location may become unstable and fall into the excavation;
  - The potential for a hazardous atmosphere exists, unless the air has been tested and found to be at safe levels; or
  - Accumulated water exists in the excavation, unless precautions have been taken to prevent excavation cave-in.
- The excavation self-assessment checklist shall be used to evaluate excavations prior to entry.

## Excavation Operations

Refer to the Excavation Entry section when entering excavations controlled by other parties. When CH2M HILL performs the excavating, a CH2M HILL excavation competent person will oversee all excavation operations and entry into excavations. The competent person shall:

- Complete the CH2M HILL Excavation Permit to ensure HSE requirements have been satisfied during excavation activities;
- Complete the CH2M HILL Daily Excavation Inspection Checklist to ensure HSE requirements have been satisfied, document that an inspection has been conducted, and to authorize entry into the excavation. A new Checklist shall be completed each day, authorizing excavation entry. Inspections should be continued as needed throughout the work shift, and after any event that could increase the potential for cave-in (e.g., rainfall); and
- Conduct daily safety briefings prior to excavation entry.

## 8.24 Fall Protection Activities

(Reference CH2M HILL, SOP HSE-308, *Fall Protection*)

Below are the hazard controls and safe work practices to follow when personnel or subcontractors are exposed to unprotected heights. Ensure the requirements in the referenced SOP are followed.

- Fall protection systems must be used to eliminate fall hazards when performing construction activities at a height of 6 feet (1.8 meters) or greater and when performing general industry activities at a height of 4 feet (1.2 meters) or greater.
- CH2M HILL staff exposed to fall hazards must complete initial fall protection training by completing either the CH2M HILL 10-Hour Construction Safety Awareness training course or the Fall Protection computer-based training module. Staff must also and receive project-specific fall protection training using the fall protection evaluation form attached to the project safety plan. Staff shall not use fall protection systems for which they have not been trained.
- The SC or designee must complete the Project Fall Protection Evaluation Form and provide project-specific fall protection training to all CH2M HILL staff exposed to fall hazards.
- The company responsible for the fall protection system shall provide a fall protection competent person to inspect and oversee the use of fall protection system. CH2M HILL staff shall be aware of and follow all requirements established by the fall protection competent person for the use and limitation of the fall protection system.
- When CH2M HILL designs or installs fall protection systems, staff shall be qualified as fall protection competent persons or work directly under the supervision of a CH2M HILL fall protection competent person.
- When horizontal lifelines are used, the company responsible for the lifeline system shall provide a fall protection qualified person to oversee the design, installation, and use of the horizontal lifeline.



- Inspect personal fall arrest system components prior to each use. Do not use damaged fall protection system components at any time, or for any reason. Fall protection equipment and components shall be used only to protect against falls, not to hoist materials. Personal fall arrest systems that have been subjected to impact loading shall not be used. SC shall periodically inspect CH2M HILL fall protection equipment using the Fall Protection Inspection Log form.
- Personal fall arrest systems shall be configured so that individuals can neither free-fall more than 6 feet (1.8 meters) or contact any lower level.
- Only attach personal fall arrest systems to anchorage points capable of supporting at least 5,000 pounds (2,268 kg). Do not attach personal fall arrest systems to guardrail systems or hoists.
- Remain within the guardrail system when provided. Leaning over or stepping across a guardrail system is not permitted. Do not stand on objects (boxes, buckets, bricks, blocks, etc.) or ladders to increase working height on top of platforms protected by guardrails.
- Only one person shall be simultaneously attached to a vertical lifeline and shall also be attached to a separate independent lifeline.

## 8.25 Flight Line Safety

Always assume that the airfield is active. An active airfield means there is the possibility, even if an area is “closed”, that aircraft or other vehicles will need access on or through a work area. There is always the potential for an incursion. If in an area of the airfield where radio contact with the control tower is required, the potential for miscommunication exists. Any mistake in communication has the potential to cause a problem with Air Operations. When maneuvering on the airfield, there are fuel trucks, helicopter rotors, jet blast, etc., all of which are potential hazards for workers. Pilots of aircraft do not expect workers to be on the airfield. If equipment is not properly marked, it may go unnoticed by pilots and present the potential for an incursion.

An aircraft always has the right of way. When working in a confined area that is “closed” to traffic, outline the work area with traffic cones or barricades that will provide a warning to other airfield traffic. This will also serve to keep vehicles from running through wet paint. Have one person designated as the point of contact who will be responsible for monitoring the radio and communicating with the control tower. That person shall be properly trained in the use of the radio, and check in daily with Air Operations to confirm work areas. Properly train workers to be aware of airfield operations going on around them, to give way to all moving aircraft, to allow great distances from aircraft, parked or running, when maneuvering on airfield.

It is inherent upon the contractor to be visible to everyone operating on the airfield. Orange and white checkered flags, flashing amber beacons, cones and/or barricades should be in good condition and clearly visible.

Speed limits on airfield area are enforced. Speed limits on an airfield are very low relative to speeds on the roads. Speeding on the airfield can lead to a possible incursion. Restricted areas, particularly on a military installation, must be strictly enforced. They are usually outlined with a red line and often have certain “Entry Control Points” painted along the red line where entry into the area is permitted. Entry into the restricted area without permission may subject the workers to arrest.

There are safety areas around runways on the airfield. All equipment and materials must be stored behind these areas. If a crew working on the runway is instructed to clear the runway, all workers and equipment must be moved beyond the safety area until given clearance by the control tower to return to the runway.

## 8.26 Forklift Operations

(Reference CH2M HILL, SOP HSE-309, *Forklifts*)

Below are the hazard controls and safe work practices to follow when working around or operating forklifts. Ensure the requirements in the referenced SOP are followed.

- Forklift operators are prohibited from using any wireless device while operating forklifts. If a wireless device is required for a certain operation, the PM and HSM must authorize the wireless use on a case by case basis and make sure limitations are addressed in the project safety plan.
- A rated lifting capacity must be posted in a location readily visible to the operator.
- A forklift truck must not be used to elevate employees unless a platform with guardrails, a back guard, and a kill switch is provided on the vehicle. When guardrails are not possible, fall arrest protection is required.
- The subcontractor operating the forklift must post and enforce a set of operating rules for forklift trucks.
- Only certified forklift operators shall operate forklifts.
- Stunt driving and horseplay are prohibited.
- Employees must not ride on the forks.
- Employees must never be permitted under the forks (unless forks are blocked).
- The driver must inspect the forklift once a shift and document this inspection.
- The operator must look in the direction of travel and must not move the vehicle until all persons are clear of the vehicle.
- Forks must be carried as low as possible.
- The operator must lower the forks, shut off the engine, and set the brakes (or block the wheels) before leaving the forklift operator's position unless maintenance or safety inspections require the forklift to be running.
- Trucks must be blocked and have brakes set when forklifts are driven onto their beds.
- Extreme care must be taken when tilting elevated loads.
- Every forklift must have operable brakes capable of safely stopping it when fully loaded.
- Forklifts must have parking brakes and an operable horn.
- When the operator is exposed to possible falling objects, industrial trucks must be equipped with overhead protection (canopy).
- If using certified CH2M HILL forklift operators—forklifts must be inspected and documented daily using the forklift inspection form.

## 8.27 Groundwater Sampling/Water Level Measurements

Below are the hazard controls and safe work practices to follow when personnel or subcontractors are performing groundwater sampling and/or water level measurements.

- Full coolers are heavy. Plan in advance to have two people available at the end of the sampling effort to load full coolers into vehicles. If two people won't be available use several smaller coolers instead of fewer large ones.
- Wear the appropriate PPE when sampling, including safety glasses, nitrile gloves, and steel toe boots (see PPE section of the project safety plan).

- Monitor headspace of wells prior to sampling to minimize any vapor inhalation (refer to the “Site Monitoring” section of the project safety plan).
- Use caution when opening well lids. Wells may contain poisonous spiders and hornet or wasp nests.
- Use the appropriate lifting procedures (see CH2M HILL SOP HSE-112) when unloading equipment and sampling at each well.
- Avoid sharp edges on well casings.
- If dermal contact occurs with groundwater or the acid used in sample preservation, immediately wash all affected skin thoroughly with soap and water.
- Avoid eating and drinking on site and during sampling.
- Use ear plugs during sampling if sampling involves a generator.
- Containerize all purge water and transport to the appropriate storage area.
- Use two people to transport full coolers/containers whenever possible. If two people are not available use a dolly to move coolers. If the coolers weigh more than 40 pounds Attachment 1 of the HSE-112, *Manual Lifting*, shall be completed by the SC. If the coolers weigh more than 50 pounds they should never be lifted by one person.

## 8.28 Hand and Power Tools

(Reference CH2M HILL, SOP HSE-210, *Hand and Power Tools*)

Hands are one of the most complex parts of the body. Every employee uses their hands to help them make a living. There are more on-the-job injuries to hands than any other body part.

Below are the hazard controls and safe work practices to follow when personnel or subcontractors are using hand and power tools. Ensure the requirements in the referenced SOP are followed.

### General

- Always select the right tool for the job;
- Keep cutting tools sharp—less force will be needed for the cut. Do not use pocket knives—only safety cutting tools and if using these be sure to comply with the “Knife Use” section of these Guidelines;
- Carry and store tools correctly and never put sharp or pointed tools in your pocket or belt;
- Tools shall be inspected prior to use and damaged tools will be tagged and removed from service;
- Store tools properly in a place where they will not be damaged or come in contact with hazardous materials; and
- Tools used in an explosive environment must be rated for work in that environment (that is, intrinsically safe, spark-proof, etc.).

### Hand and Power Tools

- Hand and power tools will be used for their intended use and operated in accordance with manufacturer’s instructions and design limitations;
- Screwdrivers are one of the most used and abused tools, never:
  - Hammer with a screwdriver
  - Use as a pry bar
  - Use with a broken handle
  - Use with worn out tips

- Maintain all hand and power tools in a safe condition;
- When possible, use power tools over hand tools. Powered tools tend to require less exertion and reduce repetitive motion. Be sure that the weight of a powered tool (and cording) does not create additional force issues.
- Whenever possible, select tools that use a full-hand power grip rather than a precision finger grip. The greater the efforts to maintain control of a hand tool, the higher the potential for injury. A compressible gripping surface rather than hard plastic should be used.
- Avoid repetitive trigger-finger actions. Select tools with large switches that can be operated with all four fingers.
- When possible, use tools with extension handles that let you stand up while performing a floor-level task (extension handles must be manufacturer-approved)
- To lessen vibration:
  - Pad tool handles with a soft compressible surface
  - Use vibration damping (gel filled) gloves
  - Select tools (hammers and chippers) with built in damping systems (springs/hydraulics)
- Maintain straight wrists. Avoid bending or rotating the wrists; a variety of bent-handle tools are commercially available.
- Avoid static muscle loading. Reduce both the weight and size of the tool. Do not raise or extend elbows when working with heavy tools.
- Use PPE (such as gloves, safety glasses, earplugs, and face shields) when exposed to a hazard from a tool;
- Do not carry or lower a power tool by its cord or hose;
- Portable power tools will be plugged into GFCI protected outlets;
- Portable power tools will be Underwriters Laboratories (UL) listed and have a three-wire grounded plug or be double insulated;
- Disconnect tools from energy sources when they are not in use, before servicing and cleaning them, and when changing accessories (such as blades, bits, and cutters);
- Safety guards on tools must remain installed while the tool is in use and must be promptly replaced after repair or maintenance has been performed;
- If a cordless tool is connected to its recharge unit, both pieces of equipment must conform strictly with electrical standards and manufacturer's specifications; and

### **Machine Guarding**

- Ensure that all machine guards are in place to prevent contact with drive lines, belts, chains, pinch points or any other sources of mechanical injury;
- Unplugging jammed equipment will only be performed when equipment has been shut down, all sources of energy have been isolated and equipment has been locked/tagged and tested; and
- Maintenance and repair of equipment that results in the removal of guards or would otherwise put anyone at risk requires lockout of that equipment prior to work.

## 8.29 Haul Trucks

Below are the hazard controls and safe work practices to follow when working around or operating haul trucks:

- Haul truck operators are prohibited from using any wireless device while operating trucks on site. Trucks must be stopped before using devices such as two way radios or cell phones. If a wireless device is required for a certain operation, the PM and HSM must authorize the wireless use on a case by case basis and make sure limitations are addressed in the project safety plan.
- Haul truck operators should be familiar with their equipment and inspect all equipment before use;
- Haul truck operators should ensure all persons are clear before operating truck or equipment. Before moving operators should sound horn or alarm, all equipment should be equipped with a working back up alarm;
- Haulage trucks or equipment with restricted visibility should be equipped with devices that eliminate blind spots;
- Employees should stay off haul roads. When approaching a haul area, employees should make eye contact and communicate their intentions directly with the equipment operator;
- If possible minimize steep grades on haul roads;
- Where grades are steep provide signage indicating the actual grade as well as measures for a runaway truck;
- Trucks are to be operated within the manufacturer's recommendations (for example- retarder charts indicate the combination of loads, grades and speeds that should not be exceeded if the truck's retarder is to work properly – to ensure the truck does not descend grade at speeds greater than listed);
- Haul roads should be well lit, sufficiently wide (at least 50 percent of the width of the equipment on both sides of road) and equipped with reflectors to indicate access points;
- Haul roads should have adequate right-of-way signs indicating haul directions;
- Haul trucks will follow designated haul roads; and
- Haul trucks will comply with posted speed limits.

## 8.30 Hoists

(Reference CH2M HILL SOP HSE-315, *Hoists*)

- Below are the hazard controls and safe work practices to follow when working around or operating hoists. Ensure the requirements in the referenced SOP are followed.
- Manufacturer's specifications and limitations applicable to the operation of material hoists shall be followed. Where manufacturer's specifications are not available, the limitations assigned to the equipment shall be based on the determinations of a professional engineer competent in the field.
- Rated load capacities, recommended operating speeds, and special hazard warnings or instructions shall be posted on hoists.
- Hoisting ropes shall be installed in accordance with the wire rope manufacturer's recommendations.
- The installation of live booms on hoists is prohibited.
- Operating rules shall be established and posted at the operator's station of on hoists.
- No person shall be allowed to ride on material hoists except for the purposes of inspection and maintenance.
- All entrances of the hoistways shall be protected by substantial gates or bars, which guard the full width of the landing entrance.

- Overhead protective coverings of 2-inch planking, ¾-inch plywood, or other solid material of equivalent strength, shall be provided on the top of every material host cage or platform.
- All hoistway entrance bars and gates shall be painted with diagonal contrasting colors, such as black and yellow.
- A qualified hoist operator will operate, inspect, maintain and oversee all hoist operations. The SC or designee shall verify hoist operator qualifications (e.g., operator to provide for the type of hoist being operated—years of experience, training, background).
- CH2M HILL employees who are required to operate hoists shall read the hoist manufacturer's operations and maintenance manual, be evaluated and approved as qualified hoist operators. The CH2M HILL may require operators to complete separate hoist operations training, provided by commercial training specialists.

## 8.31 Hydrogen Sulfide

Hydrogen sulfide (H<sub>2</sub>S) is a colorless, toxic, and flammable gas responsible for the odor of rotten eggs. It often results from the bacterial break down of organic matter in the absence of oxygen, such as in sewers. It also occurs in gases, natural gas and in well waters. H<sub>2</sub>S may be produced during the biological process when biological substrates are used to expedite the remediation process.

### Chemical Properties

Hydrogen sulfide is heavier than air and may travel along the ground. It collects in low-lying and enclosed, poorly-ventilated areas such as basements, manholes, sewer lines, and underground telephone vaults. For work within confined spaces, use appropriate procedures for identifying hazards, monitoring and entering confined spaces (see Confined Space Entry section of these Guidelines or the project safety plan). Additionally, H<sub>2</sub>S is a highly flammable gas and gas/air mixtures can be explosive. It may travel to sources of ignition and flash back. If ignited, the gas burns to produce toxic vapors and gases, such as sulfur dioxide.

### Routes of Exposure and Exposure Limit

The primary route of exposure to H<sub>2</sub>S is inhalation, and the gas is rapidly absorbed by the lungs. Absorption through the skin is minimal. People can smell the "rotten egg" odor of H<sub>2</sub>S at low concentrations in air. However, with continuous low-level exposure, or at high concentrations, a person loses his/her ability to smell the gas even though it is still present; this is called olfactory fatigue. This can happen very rapidly and at high concentrations, the ability to smell the gas can be lost instantaneously. Therefore, DO NOT rely on your sense of smell to indicate the continuing presence of H<sub>2</sub>S or to warn of hazardous concentrations.

About half of the population can smell H<sub>2</sub>S at concentrations as low as 0.5 parts per billion (ppb) in air, and more than 90 percent can smell it at levels of 50 ppb. At higher concentrations H<sub>2</sub>S rapidly deadens the sense of smell. For most people, this occurs at approximately 150 ppm.

The American Conference of Governmental Industrial Hygienists (ACGIH) 8-hr time-weighted average (TWA) exposure limit for H<sub>2</sub>S is 1 ppm; the 15-minute short term exposure limit (STEL) is 5 ppm.

The Immediately Dangerous to Life or Health (IDLH) in air is 100 ppm, with exposure of 800 to 1,000 ppm fatal in 30 minutes.

### Effects on the Body

Hydrogen sulfide is both an irritant and a chemical asphyxiant with effects on both oxygen utilization and the central nervous system. Its health effects can vary depending on the level and duration of exposure. Low concentrations irritate the eyes, nose, throat and respiratory system (e.g., burning/tearing of eyes, cough, shortness of breath). Asthmatics may experience breathing difficulties. The effects can be delayed for several hours, or sometimes several days, when working in low-level concentrations. Repeated or prolonged exposures may cause eye inflammation, headache, fatigue, irritability, insomnia, digestive disturbances and weight loss.

Moderate concentrations can cause more severe eye and respiratory irritation (including coughing, difficulty breathing, and accumulation of fluid in the lungs), headache, dizziness, nausea, vomiting, staggering and excitability.

High concentrations can cause shock, convulsions, inability to breathe, extremely rapid unconsciousness, coma and death.

### **H<sub>2</sub>S as a Project Hazard**

Elevated levels of H<sub>2</sub>S have not been reported during normal drilling activities, but experience has shown that high levels of H<sub>2</sub>S may be present in the well space and in the breathing zone following the injection of emulsified oil, once the biological process has had time to progress. Engineering controls shall be considered to bring the concentrations of H<sub>2</sub>S down to an acceptable level in the breathing zone, followed by administrative controls, and respiratory protection.

All employees will receive orientation on the emergency contingency plan for the specific actions to follow when there is an H<sub>2</sub>S release from equipment, fire involving H<sub>2</sub>S, or medical emergency involving exposure to H<sub>2</sub>S.

### **Air Monitoring**

Follow the air monitoring action levels in the project safety plan. If elevated levels of H<sub>2</sub>S are encountered, first implement engineering controls to reduce exposures to allowable levels. If that is not possible, then an upgrade in PPE may be required; refer to the PPE section of the project safety plan.

## **8.32 Lead**

(Reference CH2M HILL SOP HSE-508, *Lead*)

CH2M HILL is required to control employee exposure to lead when exposures are at or above 30 µg/m<sup>3</sup> by implementing a program that meets the requirements of the OSHA Lead standard, 29 CFR 1910.1025 and 29 CFR 1926.62. The elements of the CH2M HILL lead program include the following:

- Exposure monitoring;
- Methods of control, including personal protective equipment (PPE) and respirators;
- Medical surveillance;
- Training on hazards of lead and control measures (includes project-specific training and the computer-based training on CH2M HILL's Virtual Office, *Lead Exposure Training*); and
- Record keeping requirements.

If air monitoring indicates there is potential exposure at the action level concentrations above, notify the RHSM to ensure the above have been adequately addressed. Other exposure control measures include:

- Do not enter regulated work areas unless training, medical monitoring, and PPE requirements established by the competent person have been met;
- Do not eat, drink, smoke, chew tobacco or gum, or apply cosmetics in regulated areas;
- Respiratory protection and other exposure controls selection shall be based on the most recent exposure monitoring results obtained from the competent person; and
- Review the fact sheet included as an attachment to the SOP.

## 8.33 Lockout/Tagout Activities

(Reference CH2M HILL SOP HSE-310, *Lockout and Tagout*)

Lockout/tagout (LO/TO) shall be performed whenever service or maintenance is necessary on equipment that could cause injury to personnel from the unexpected equipment energizing or start-up or unexpected release of stored energy. Energy sources requiring lockout/tagout may include electrical, pneumatic, kinetic, and potential.

If work on energized electrical systems is necessary—contact the RHSM. Specific training and procedures are required to be followed before any work on energized electrical systems can be performed and are NOT covered in this section. Energized electrical work is defined as work performed **on or near** energized electrical systems or equipment with exposed components operating at 50 volts or greater. Working near energized live parts is any activity inside a Limited Approach Boundary (anywhere from 3.5 feet to 24 feet [1 meter 7.3 meters] depending on voltage). Examples of energized electrical work include using a voltmeter to troubleshoot electrical systems and changing out controllers.

When lockout/tagout is necessary to perform maintenance/repair of a system, all the requirements of SOP HSE-310, Lockout and Tagout, shall be met including the following bulleted items:

- When CH2M HILL controls the work, CH2M HILL must verify that subcontractors affected by the unexpected operation of equipment develop a written lockout/tagout program, provide training on lockout/tagout procedures and coordinate its program with other affected subcontractors. This may include compliance with the owner or facility lockout/tagout program.
- When CH2M HILL personnel are affected by the unexpected operation of equipment they must complete the electrical safety awareness module on the VO. Authorized personnel shall inform the affected personnel of the LO/TO. Affected personnel shall not tamper with LO/TO devices.
- Standard lockout/tagout procedures include the following six steps: 1) notify all personnel in the affected area of the lockout/tagout, 2) shut down the equipment using normal operating controls, 3) isolate all energy sources, 4) apply individual lock and tag to each energy isolating device, 5) relieve or restrain all potentially hazardous stored or residual energy, and 6) verify that isolation and deenergization of the equipment has been accomplished. Once verified that the equipment is at the zero energy state, work may begin.
- All safe guards must be put back in place, all affected personnel notified that lockout has been removed and controls positioned in the safe mode prior to lockout removal. Only the individual who applied the lock and tag may remove them.
- CH2M HILL authorized employees shall complete the LO/TO training module on the VO and either the electrical safety training module on the VO or 10-hour construction training. The authorized employee must also be trained and qualified on the system they are working on (e.g., qualified electrician for working on electrical components of a system).
- When equipment-specific LO/TO procedures are not available or when existing procedures are determined to be insufficient, CH2M HILL authorized employees shall also complete the Equipment-Specific LO/TO Procedure Development Form, provided as an attachment to the SOP, to create an equipment-specific lockout/tagout procedure.

## 8.34 Avoidance of Munitions and Explosives of Concern (MEC) and/or Materials Potentially Posing an Explosives Hazard (MPPEH)

(Reference CH2M HILL, SOP HSE-610, *Explosives Usage and Munitions Response*)

If work will be conducted on a government/military facility or ex-government/military facility; area currently or previously used as a range; or if military munitions, MEC, or unexploded ordnance (UXO) are associated with the



scope of work or location immediately contact the CH2M HILL Central Point of Contact for Explosives Usage and Munitions Response. The following will be required prior to any field work:

- Setting up a conference call with all required personnel to conduct a basic safety risk assessment over the phone.
- Providing written directions detailing job-specific requirements and what actions to take to ensure safety during the work.
- “3R Training” will be required for all affected project personnel. This training teaches personnel to Recognize, Retreat, and Report.

## 8.35 Marijuana Cultivation Sites

Marijuana grow sites are illegal on public lands, but are becoming more common. These sites may be encountered when working in undeveloped or “back country” areas. These sites pose risks to workers, the public, and the environment and are most often associated with organized crime. The potential for violent confrontations is high.

Grow sites have been discovered in California forest areas including Shasta Trinity National Forest other national forest areas including San Bernardino, Los Padres, and Angeles.

Most marijuana grow sites have someone always watching the site. Even unattended sites pose a significant risk. Recognize the signs of marijuana cultivation sites, and if you think you are near one, be quiet and leave the area immediately.

How to recognize a cultivation site:

- Sometimes marijuana smells like a skunk on hot days.
- Hoses or drip lines (made of black or white PVC piping or rubber hose) located in unusual or unexpected places.
- Discarded containers of herbicides, pesticides or other chemicals. A variety of chemicals for pest and animal control, including chemicals that may be so hazardous they are illegal in the United States are sometimes encountered.
- A well-used trail where there shouldn’t be one.
- People standing along roads without vehicles present, or in areas where loitering appears unusual.
- Grow sites are usually found in isolated locations, in rough steep terrain. Look for signs of cultivation, cleared vegetation, soil disturbance.
- Food cached near trailheads or alongside roads.
- Sights or sounds of human activity in remote forest areas.
- Camps containing cooking and sleeping areas with food, fertilizer, weapons, garbage, rat poison, and/or dead animals.
- Small propane bottles, used to avoid the detection of wood smoke.
- Individuals armed with rifles outside of hunting season.
- Paper cups, chicken wire or plastic sheets used for starting and protecting plants.

As soon as you become aware that you have come upon a cultivation site, leave the way you came in immediately and make as little noise as possible. Never engage the growers as these are extremely dangerous people. If you can identify a landmark or it is helpful for authorities, but put your own safety first. The growers may be present and may or may not know that you have found their grow site. Get to a safe place and report as much detail

about the location and incident as you can recall to authorities. Ensure you contact the RHSM and Project Manager as soon as possible.

Other precautions to take include:

- Check with local law enforcement officers to see whether they know of any dangers or concerns in the area where you will be working.
- Establish and follow check-in and checkout procedures every day.
- Make sure your supervisor and the dispatch office know where you will be working.
- If necessary, agree on a phrase that you would use to let your co-workers (SC, RHSM, or PM) know you are in danger and need law enforcement assistance immediately at your last known location.
- Make sure you have a working communication device.
- Use the buddy system. Work in pairs.
- Park your vehicle so it's pointing in the direction of escape.

## 8.36 Methane (as a Product of Injection Activities)

Methane is a colorless, odorless gas with a wide distribution in nature. Methane is created when organic matter decomposes (rots) without any oxygen present ("anaerobic" decomposition) and is common in landfills, marshes, septic systems and sewers.

Methane may be produced as a by-product of the biological process when biological additives are used in a remediation process (such as when emulsified oil is injected to enhance dechlorination of contaminated groundwater).

Experience has shown that methane may be present in the well space following the injection of emulsified oil, once the biological process has had time to progress. This needs to be considered when returning to collect ground water samples. Although methane degrades Engineering controls shall be considered to bring the concentrations of methane down to an acceptable level in the breathing zone.

Methane is a "simple asphyxiant," which means that it can displace available oxygen. Methane is combustible and mixtures of methane with air are explosive within the range 5-15 percent by volume of methane (the lower and upper explosive limits). At room temperature, methane is lighter than air, so in an outdoor environment, it tends to dissipate.

Methane is not toxic when inhaled, but it can produce suffocation by reducing the concentration of oxygen inhaled. When exposed to concentrations high enough to displace oxygen, you may experience dizziness, deeper breathing, possible nausea and eventual unconsciousness.

The primary danger is from fire and explosion, so ensure that you work in a well-ventilated area, and that there is no source of ignition present. Use spark-proof tools and intrinsically safe equipment, if necessary. If working in a confined space, make sure that appropriate controls are in place and follow an approved permit-required confined space entry plan.

## 8.37 Methane (as Landfill Gas or Shale Formations)

- Landfill gas is normally made up of 50 percent methane and 50 percent carbon dioxide.
- Shale formations can produce methane that has the potential to be released during drilling or groundwater sampling.
- Other constituents have been found in the landfill gas. These may include hydrogen sulfide, tetrachloroethene, ethyl benzene, toluene, and xylenes.

- Continuous monitoring is required when performing intrusive activities (e.g., excavation, drilling) in a methane area. This includes refuse and any cover material.
- Monitoring will be conducted with oxygen/combustible gas meters.
- All instruments will be calibrated according to manufacturer's specifications. Instruments will be calibrated at the frequency specified by the manufacturer.
- Ventilation is the primary control to reduce the fire potential from methane. The action required for ventilation include:
- Natural Ventilation – If the wind speed across the bore hole or sampling apparatus is over 5 mph (8 kph) then natural ventilation is sufficient. Equipment and personnel must be located upwind of the potential methane source to prevent any ignition source from contacting methane in air.
- Forced Ventilation – If the wind speed across the bore hole or sampling apparatus is less than 5 mph (8 kph) then forced ventilation is required. Large air movers are preferable but standard ventilation fans may be used if the air flow is directed to the bore hole or the location in the sampling apparatus where the methane first encounters open air.

## 8.38 Methylene Chloride

(Reference CH2M HILL SOP HSE-509, *Methylene Chloride*)

Methylene chloride has a faint, sweet odor which is not noticeable at dangerous concentrations. Methylene chloride is shipped as liquefied compressed gas and will cause frostbite on contact.

CH2M HILL is required to control employee workplace exposure to methylene chloride when personal exposures are at or above 12.5 parts per million (ppm) as an 8-hour time-weighted average (TWA) or above 125 ppm short-term exposure limit (STEL) by implementing a program that meets the requirements of the OSHA Methylene Chloride standard, 29 *Code of Federal Regulations* (CFR) 1910.1052. The elements of the CH2M HILL methylene chloride program include the following:

- Exposure monitoring;
- Methods of control, including personal protective equipment (PPE) and respirators;
- Medical surveillance;
- Training on hazards of methylene chloride and control measures (includes project-specific training and the computer-based training on CH2M HILL's Virtual Office, *Methylene Chloride*) and;
- Recordkeeping requirements.

If air monitoring indicates there is potential exposure at the action level concentrations above, notify the RHSM to ensure the above have been adequately addressed. Other exposure control measures include:

- Do not enter regulated work areas unless training, medical monitoring, and PPE requirements established by the competent person have been met;
- Do not eat, drink, smoke, chew tobacco or gum, or apply cosmetics in regulated areas;
- Respiratory protection and other exposure controls selection shall be based on the most recent exposure monitoring results obtained from the competent person;
- Appropriate air-supplied respirators must be used when methylene chloride exposures exceed PEL or STEL;
- Air supplied to respirators must meet Grade D breathing air requirements; and
- Review the fact sheet included as an attachment to the SOP.

## 8.39 Naturally Occurring Radiation Materials (NORM)

Naturally Occurring Radiation Materials (NORM) is found in the earth's crust, soil, plants and many living organisms. The geologic formations that contain oil and gas deposits also contain NORM, commonly consisting of the elements of uranium, radium, thorium and their associated decay products. If present, these radio nuclides dissolve in water and can be bound into the scale deposited in production equipment handling produced water. Radon gas follows the propane/ethane streams of produced (natural) gas and the radon gas byproducts (radon daughters) can be deposited on the inside surfaces of gas handling equipment. Land can be contaminated with NORM from descaling operations, contaminated sludges, and/or residual from produced water.

Equipment that can contain NORM-contaminated scale includes equipment associated with the separators (separate gas from the oil and water) and heater treaters (divide the oil and water phases) such as flowlines, pumps, valves, and piping (especially transition pieces such as elbows and reducer) and filters.

Gas processing equipment can also be contaminated with NORM (radon daughters). This contamination, unlike scales, can be in the form of an invisible film inside gas equipment and can only be detected by internal surveying with appropriate instrumentation.

Natural gas liquid equipment can also be contaminated by radon in the gas. Sludges accumulated in this equipment may contain the heavy metal radon daughters that have attached to dust and other particles that become part of the sludge.

While NORM has generally been associated with exploration and production activities, there is some industry experience to indicate that some refinery process equipment can also be contaminated with NORM, including natural gas stream equipment, crude tank bottoms, desalters, overhead atmospheric pipestill equipment, and exchanger deposits/sludge.

### Hazards of NORM

NORM generally does not present an external radiation (Gamma) hazard to employees working around closed process equipment. This is particularly the case with NORM associated with scale inside equipment handling production water due to attenuation by the scale and steel pipe wall. Recent field experience, however, indicates that some in-service gas processing equipment, particularly valves, elbows, or transition piping pieces, may have fairly high external Gamma radiation levels. If gas-processing equipment is out of service for more than 4 hours, external Gamma measurements will not detect internal accumulation of the radon daughters.

Work procedures are recommended when maintaining NORM contaminated equipment such as pipelines, filters, pumps, lines, sludge or wellhead equipment. The exposure risk is highest when grinding, cutting, polishing, or performing other work that may generate dust. These dusts present inhalation hazards that result in internal exposures to radioactive material.

- Radium, radon, and their decay products are radioactive elements of concern in petroleum production and gas processing. Exposure may occur when contaminated dusts and sludge are inhaled or ingested (internal exposure) or when radiation from surrounding equipment strikes the body (external exposure).
- Radium is found in most oil and gas fields in the world in varying concentrations. There is potential to find radium in significant amounts in almost all types of equipment. Radon is found in most natural gas deposits in the world.
- Radon itself does not present a health hazard because it is not easily absorbed into the body and is quickly cleared when absorbed.
- Radon's radioactive breakdown products, called radon "daughters," may be hazardous. Radon naturally breaks down into radioactive metals before becoming non-radioactive lead.

- Radon daughters may be inhaled or ingested when attached to scale or dust generated during equipment inspection and repair. Radon daughter overexposure has been associated with an increased risk of lung cancer.

### **NORM Hazard Control Measures**

- For operations where NORM is a potential hazard, a qualified individual (s) will be assigned for implementing radiological protection of employees, members of the public, and the environment.
- Surveys and monitoring must be conducted to evaluate the potential radiological hazards. The surveys must include measurements for radiation levels based on the concentrations or quantities of radioactive material, along with any other measurements or evaluations necessary to characterize the potential radiological hazards that could be present.
- Equipment contaminated with NORM must be labeled.
- Gas processing equipment should be opened to allow gas to escape, and allowed to stand idle for at least 4 hours prior to any entry.
- Water washing of any equipment prior to entry is recommended when practical.
- Personal protective equipment (PPE) must be selected based on the hazards (both radiological and non-radiological) work activities to be conducted, and the contamination levels in the work area,
  - Level D PPE must be worn to minimize skin contact with NORM such as gloves and appropriate body protection. Disposable clothing such as TYVEK is preferred since NORM contaminated clothing should be laundered.
  - Level C PPE using full-face air-purifying respirator with high efficiency particulate air (HEPA filters) must be worn if dust exposure is expected.
- Do not sand, grind, cut, or weld on surfaces contaminated with NORM without appropriate cleaning. Equipment should be resurveyed after cleaning prior to these activities.
- NORM-contaminated equipment or material should not be shipped offsite for repair or disposal without first contacting the designated NORM coordinator ( may be the RHSM and/or REM)

## **8.40 PCB/Ballast Handling**

Fluorescent lighting used in many older buildings use ballast resistors that contain polychlorinated biphenyl (PCB) oil. PCB is colorless to light-colored, viscous liquid with a mild, hydrocarbon odor.

PCB has been found to cause, irritation eyes; chloracne; liver damage; reproductive effects; and has shown to cause cancer in lab animals.

When work requires the handling or removal of fluorescent ballast resistors, extra care and attention needs to be taken. While ballasts are usually well sealed, it is not uncommon to find a ballast resistor that has leaked. Below are the hazard controls and safe work practices to be followed when PCBs are present.

- A survey must be made to determine whether ballast resistors contain PCB fill.
- Leaking resistors must be identified and handled with appropriated PPE.
- Exposure Routes are inhalation, skin absorption, ingestion, skin and/or eye contact
- Prevent skin contact by using chemical resistant gloves, wear eye protection, and thoroughly wash hands before eating or smoking.
- Ensure eyewash is available.
- In the event of exposure, follow the following First Aid procedures:  
Eyes: Irrigate immediately

Skin: Soap wash immediately

Ingestion: Seek medical attention immediately

- Dispose of PCB ballast resistors in accordance with Federal, State and Local environmental regulations.

## 8.41 Portable Generator Hazards

(Reference CH2M HILL SOP HSE-206, *Electrical Safety*)

- Portable generators are useful when temporary or remote electric power is needed, but they also can be hazardous. The primary hazards to avoid when using a generator are carbon monoxide (CO) poisoning from the toxic engine exhaust, electric shock or electrocution, and fire.
- NEVER use a generator indoors or in similar enclosed or partially-enclosed spaces. Generators can produce high levels of carbon monoxide (CO) very quickly. When you use a portable generator, remember that you cannot smell or see CO. Even if you can't smell exhaust fumes, you may still be exposed to CO.
- If you start to feel sick, dizzy, or weak while using a generator, get to fresh air RIGHT AWAY. DO NOT DELAY. The CO from generators can rapidly lead to full incapacitation and death.
- If you experience serious symptoms, get medical attention immediately. Inform project staff that CO poisoning is suspected. If you experienced symptoms while indoors have someone call the fire department to determine when it is safe to re-enter the building.
- Follow the instructions that come with your generator. Locate the unit outdoors and away from doors, windows, and vents that could allow CO to come indoors.
- Ensure the generator is grounded in accordance with the manufacturer's operation manual.
- Keep the generator dry and do not use in rain or wet conditions. To protect from moisture, operate it on a dry surface under an open, canopy-like structure. Dry your hands if wet before touching the generator.
- Plug appliances directly into the generator. Or, use a heavy duty, outdoor-rated extension cord that is rated (in watts or amps) at least equal to the sum of the connected appliance loads. Check that the entire cord is free of cuts or tears and that the plug has all three prongs, especially a grounding pin.
- Most generators come with Ground Fault Circuit Interrupters (GFCI). Test the GFCIs daily to determine whether they are working
- If the generator is not equipped with GFCI protected circuits plug a portable GFCI into the generator and plug appliances, tools and lights into the portable GFCI.
- Never store fuel near the generator or near any sources of ignition.
- Before refueling the generator, turn it off and let it cool down. Gasoline spilled on hot engine parts could ignite.

## 8.42 Powder-Actuated Tools

(Reference CH2M HILL SOP HSE-210, *Hand and Power Tools*)

Below are the hazard controls and safe work practices to follow when working around or using powder-actuated tools. Ensure the requirements in the referenced SOP are followed.

- Only trained personnel are permitted to operate powder-actuated tools.
- Inspect and test powder-actuated tools each day before they are loaded per manufacturer's instruction. Remove from service any tool that is not in proper working order.
- Wear appropriate personal protective equipment (eye, face, and hearing protection) when using powder-actuated tools.

- Never point powder-actuated tools at other workers, whether empty or loaded. Tools shall not be loaded until just before use. Never leave loaded tools unattended.
- Do not drive fasteners into very hard or brittle materials such as, cast iron, glazed tile, surface-hardened steel, glass block, live rock, face brick, or hollow tile.
- Avoid driving fasteners into easily penetrable materials unless backing is provided. Pins or fasteners can otherwise become flying missiles when they pass right through such materials.
- Use powder-actuated tools with the manufacturer's specified guard, shield, or other attachment.
- Do not use powder-actuated tools in explosive or flammable atmospheres.

## 8.43 Pressure Line/Vessel Systems

- Operate and maintain pressure vessels, pumps and hosing in accordance with the manufacturer's recommendations.
- Do not exceed the rated pressure of the vessels and hosing of the system.
- The system must be provided with a pressure relief valve/controller that safely reduces the system pressure to within the system rated pressure.
- The pressure relief valve must be rated at no more than 110 percent the rated pressure of the system and must be tested at regular intervals.
- Each vessel must be equipped with a functioning pressure gauge to monitor pressure.

## 8.44 Pressure Washing Operations

Below are the hazard controls and safe work practices to follow when working around or performing pressure washing.

- Only trained, authorized personnel may operate the high-pressure washer.
- Follow manufacturer's safety and operating instructions.
- Inspect pressure washer before use and confirm deadman trigger is fully operational
- The wand must always be pointed at the work area.
- The trigger should never be tied down
- Never point the wand at yourself or another worker.
- The wand must be at least 42 inches (1.1 meter) from the trigger to the tip and utilize greater than 10 degree tips.
- The operator must maintain good footing.
- Non-operators must remain a safe distance from the operator.
- No unauthorized attachment may be made to the unit.
- Do not modify the wand.
- All leaks or malfunctioning equipment must be repaired immediately or the unit taken out-of-service.
- Polycoated Tyvek or equivalent, 16-inch-high steel-toed rubber boots, safety glasses, hard hat with face shield, and inner and outer nitrile gloves will be worn, at a minimum.

## 8.45 Process Safety Management

(Reference CH2M HILL SOP HSE-213, *Process Safety Management*)

- All CH2M HILL projects require a systematic evaluation of processes to prevent, or minimize the consequences of, catastrophic releases of toxic, reactive, flammable, or explosive chemicals at or above the specified threshold quantities listed in Appendix A, List of Highly Hazardous Chemicals, Toxics, and Reactives in OSHA Standard 29 CFR 1910.119, Process Safety Management.
- A Process Hazard Analysis (PHA) is required of all processes covered by PSM.
- Operating procedures shall be developed and implemented that provide clear operating instructions consistent with the process safety information.
- Contractors, whether considered to be CH2M HILL or a subcontractor of CH2M HILL, performing maintenance or repair, turnaround, major renovation, or specialty work on or adjacent to a covered process shall be informed by the client of the known potential fire, explosion, and toxic release hazards related to the contractor work and the provisions of the emergency action plan.
- CH2M HILL projects shall develop and implement the written procedure requirements to maintain the mechanical integrity of pressure vessels, storage tanks, piping systems, relief and vent systems, emergency shutdown systems, and controls and pumps process systems.
- A hot work permit shall be completed for any CH2M HILL work involving welding, cutting, brazing, or similar flame- or spark-producing operations conducted near a covered process.
- Written procedures shall be developed, updated, and implemented to manage changes in chemicals, technology, equipment, and facilities.
- An incident report form (IRF) shall be completed within 24 hours of a PSM-related incident. Incidents involving a release of highly hazardous chemicals shall be reported following the Serious Incident Reporting section of SOP HSE-111.
- An investigation shall be initiated as soon as possible, but no later than 48 hours following an incident that resulted in, or could reasonably have resulted in, a catastrophic release of a highly hazardous chemical.
- An emergency action plan shall be developed and implemented for the entire plant, including procedures for handling small releases.
- A facility or process audit shall be performed every three years to certify compliance with the PSM standard.
- All information regarding compliance with PSM requirements shall be made available to affected personnel without regard to possible trade secret status.
- CH2M HILL employees shall be trained before operating a newly assigned process or when involved in maintaining equipment. Refresher training shall be provided at least every three years and more often if necessary to assure the employee understands and adheres to the current operating procedures of the process.

## 8.46 Radar Hazards

Airports and all branches of the military use radar of significant power for buildings, towers, aircraft, ships, armor vehicles, and installations in general. Radar devices may emit harmful microwave radiation emissions. Microwave radiation is absorbed by the body and dissipated in the tissue as heat.

The penetration ability of the radiation depends on the wavelength. Microwave wavelengths of 25-200 centimeters have the ability to reach the internal organs with potentially damaging effects. Wavelengths less than 25 centimeters are absorbed and dissipated by the skin and the human body is thought to be transparent to microwave wavelengths greater than 200 centimeters. The health effects of microwave radiation include deep



burns and thermal damage to any organ or organ system with low blood flow, most notably the lenses of the eyes. If adequate time has elapsed between exposures, the repair mechanisms of the lens seem to limit damage. Microwave radiation cannot be seen and its effects cannot be felt until serious damage has already occurred.

The OSHA exposure limit is 10 milliwatts per square centimeter (10 mW/cm<sup>2</sup>) averaged over any 6-minute period.

Warning signs must be posted in areas where potentially damaging microwave radiation exists.

The prevention method for microwave radiation exposure is to not be in the path of radar or other microwave emitting devices by either ensuring that the device is not operating or ensuring that there is sufficient shielding between you and the microwave source.

## 8.47 Rail Road Safety

Careful observation of railroad safety requirements is essential and is governed by the Federal Railroad Administration (FRA). For railroads involving Union Pacific Railroads (UPRR), refer to the “Minimum Safety Requirements for Engineering Department Contractors,” of the ESBG HSSE SharePoint site which addresses training, minimum PPE, and safety requirements.

Permission to enter railroad property must be obtained from the local railroad. Working alone is not anticipated for this work. Contact the RHSM if working alone in the vicinity of railroads becomes necessary. Additional hazard controls will be evaluated by the RHSM and incorporated into the project safety plan.

If required by the client or railroad, all employees must participate in and comply with any job briefings conducted by the railroad’s employee in charge (EIC). During these briefings, the railroad’s EIC will specify safe work procedures, the potential hazards of the job, and emergency response procedures.

The following PPE must be worn when working around trains and rail-yards.

- Reflective/high-visibility safety vests (orange or green-yellow);
- ANSI Z87.1-approved safety glasses shall be worn to protect from flying debris;
- ANSI-approved hard hat;
- Safety-toed boots;
- Hearing protection is required when employees are within 100 feet of locomotive or roadway/work equipment; 15 feet of power operated tools 150 feet of jet blowers or pile drivers 150 feet of retarders in use (when within 10 feet, employees must wear dual ear protection – plugs and muffs); and
- Any other PPE as required by the PPE section of the project safety plan.

Other general safety requirements include:

- Any work conducted within 25 feet of active tracks must first be approved by the client and any EIC requirements addressed (preferably in an AHA). Training (i.e., On-track Railroad Safety Training) is required by the Federal Railroad Administration in these instances. Coordinate this training with the RHSM or Safety Program Assistant (SPA).
- Attend client’s safety training courses, as required, and carry or maintain proof of training as required by the client;
- Always pay attention to moving trains – never assume they are looking out for you;
- Work as far from traveled way as possible to avoid creating confusion for trains;
- Use the “buddy system” when work does not face the direction in which trains are coming from.
- The railroad must be promptly notified of any reportable injury;
- The railroad must be promptly notified of any damage to railroad property;

- All waste must be properly disposed of. No fires are permitted;
- All contractor's vehicles stop at all railroad crossings to ascertain the way is clear;
- Always be on alert for moving equipment in either direction on the tracks. Do not stop or walk on the top of rail, frog, switches, guard rails, or other track components.
- When walking around a standing rail car, stay at least 20 feet behind it. Do not walk between rail cars unless there is a 50 feet clearance between cars. Do not sit on, lie under, or cross between cars.
- No tools or materials are to be left close to the track when trains are passing.

## 8.48 Rigging

(Reference CH2M HILL SOP HSE-316, *Rigging*)

Below are the hazard controls and safe work practices to follow when personnel are overseeing or performing rigging. Ensure the requirements in the referenced SOP are followed.

### 8.48.1 General

- All rigging equipment shall be used only for its intended purpose, inspected by a competent person prior to use, and shall not be loaded in excess of its capacity rating. Defective rigging shall be removed from service.
- When CH2M HILL is in control of rigging operations, CH2M HILL shall provide a rigging competent person that will inspect, maintain oversee all rigging operations. The competent person shall use the appropriate rigging inspection log form to inspect wire rope, synthetic slings and/or shackles.
- Tag lines shall be attached to every load being lifted by a crane.
- Rigging equipment shall be protected from flame cutting and electric welding operations, and or contact avoided with solvents and chemicals.
- Rigging equipment, when not in use, shall be stored in an area free from damage caused by environmental elements, hazardous substances, and other factors that may compromise equipment integrity and performance.
- No modification or addition, which that could affect the capacity and or safe operation of the equipment, shall be made without the manufacturer's written approval.
- Rigging equipment shall not be shortened with knots, bolts or other makeshift devices.
- All rigging equipment shall be load tested at least annually by a competent person and documented.
- Special hoisting devices, slings, chokers, hooks, clamps, or other lifting accessories shall be marked to indicate the safe working loads and shall be proof -tested prior to initial use to 125 percent of their rated load. Vendors or suppliers will provide documentation of proof testing documentation.

### 8.48.2 Equipment

- Protruding end strands of wire rope shall be covered or blunted.
- Wire rope shall not be used, if in any length of eight diameters, the number of total number of visible broken wires exceeds 10 percent of the total number of wires, or if the rope shows other signs of excessive wear, corrosion, or defect.
- When inspecting the end fittings of wire rope slings, if more than one wire in a lay is broken in the fitting, do not use the sling.

- Synthetic web slings shall be immediately removed from service if any of the following conditions are present:
  - acid or caustic burns; melting or charring of any part of the sling
  - surface; snags, punctures, tears or cuts; broken or worn stitches; distortion of fittings;
  - discoloration of or rotting; red warning line showing.
- Never use makeshift hooks, links or other fasteners. Job or shop hooks and links, or makeshift fasteners, formed from bolts, rods, etc., or other such attachments, shall not be used.
- Alloy steel chains shall have permanently affixed identification stating size, grade, rated capacity and reach.
- Shackles and hooks shall be constructed of forged alloy steel with the identifiable load rating on the shackle or hook.

### 8.48.3 Rigging Use

- Rigging shall not be pulled from under a load when the load is resting on the rigging.
- Place sling(s) in center bowl of hook.
- When attaching slings to the load hoist hook, corners and sharp edges should be “packed” to prevent cutting or damaging the rope or slings.
- Never use nylon, polyester, or polypropylene web slings, or web slings with aluminum fittings shall not be used where fumes, vapors, sprays, mists or liquids of acids, caustics or phenolics are present.
- Natural and synthetic fiber rope slings, except for wet frozen slings, may be used in a temperature range from minus 20° F to plus 180° F without decreasing the working load limit. For operations outside this temperature range, and for wet frozen slings, the sling manufacturer’s recommendations shall be followed.
- When used for eye splices, the U-bolt shall be installed so that the “U” section is in contact with the dead end of the rope.

## 8.49 Scaffolds

(Reference CH2M HILL SOP HSE-311, *Scaffolds*)

Below are the hazard controls and safe work practices to follow when personnel or subcontractor personnel are using scaffolds. Ensure the requirements in the referenced SOP are followed.

### 8.49.1 Working from Scaffolds

- All scaffolds must be designed by a qualified person and installed under the supervision of a competent person.
- Do not access scaffolds until the competent person has completed the work shift inspection and has authorized access.
- Follow all requirements established by the competent person or as identified on the scaffold tag.
- Do not access scaffolds until authorized by the competent person.
- Do not access scaffolds that are damaged or unstable at any time and for any reason.
- Only access scaffolds by means of a ladder, stair tower, ladder stand, ramp, integral prefabricated scaffold access, or other equivalent safe means of access. Scaffold cross-bracing shall not be used to access scaffold platforms.
- Remain within the scaffold guardrail system when provided. Leaning over or stepping across a guardrail system is not permitted.
- Use personal fall arrest systems when required by the competent person and when working from suspension scaffolds or boatswains’ chairs.

- Do not stand on objects (boxes, buckets, bricks, blocks, etc.) or ladders on top of scaffold platforms to increase working height unless the platform covers the entire floor area of the room.
- Do not work on scaffolds covered with snow, ice, or other slippery material or work on scaffolds during storms or high winds unless personal fall arrest systems or wind screens are provided and the competent person determines it is safe to remain on the scaffold.
- Do not overload scaffold planks over their rated weight bearing capacity. When feasible, place loads directly over the scaffolds vertical weight bearing structures.

### 8.49.2 Supported Scaffolds

This section covers the erection, use, and dismantling of supported scaffolds. Supported scaffolds consist of one or more platforms supported by outrigger beams, brackets, poles, legs, uprights, posts, frames, or similar rigid support. Supported scaffolds include frame, fabricated frame, tube and coupler, pole, bricklayer's, and step platform. The common requirements for all supported scaffolds are addressed here; the competent person shall ensure scaffold type specific requirements are included as applicable.

- CH2M HILL staff erecting, dismantling, or working on scaffolds must complete the CH2M HILL 10-Hour Construction Safety Awareness training course. Staff must also and receive project-specific scaffold training from a qualified person. Staff shall not use scaffold systems for which they have not been trained.
- A CH2M HILL scaffold competent person shall be assigned to direct and oversee the erection, dismantling, and use of scaffolds. Additionally, they must inspect scaffolds each day prior to use.
- Scaffolds shall be designed by a qualified person and shall be constructed and loaded in accordance with that design.
- Stationary scaffolds over 125 feet (38.1 meters) in height and rolling scaffolds over 60 feet (18.3 meters) in height must be designed by a professional engineer.
- A tag and permit system shall be used to inform personnel of the construction status of the scaffold. At a minimum, the system used shall inform users when a scaffold is complete and safe to be used and when a scaffold is under construction and is not ready to be used. When additional precautions are required to use the scaffold safely, for example, the use of fall protection systems, the system shall identify the precautions to be taken. The tag or permit shall be placed at each means of access to the scaffold. The competent shall be responsible for the tag and permit system.
- A daily safety briefing shall be conducted with all scaffold personnel to discuss the work planned for the day and the HSE requirements to be followed.
- Scaffolds and scaffold components must be capable of supporting, without failure, their own weight and at least 4 times their maximum intended load.
- The site must be inspected to determine ground conditions, strength of supporting structure, and for proximity of electric power lines, overhead obstructions, wind conditions, the need for overhead protection or weather protection coverings.
- Supported scaffolds must be set on base plates, mudsills, or other adequate firm foundation.
- Frame spacing and mudsill size can only be determined after the total loads to be imposed on the scaffold and the strength of the supporting soil or structure are calculated and considered. This analysis must be done by a qualified person.
- Base plates or screwjacks with base plates must be in firm contact with both the sills and the legs of the scaffolding. Compensate for uneven ground with screwjacks with base plates. DO NOT USE unstable objects such as blocks, loose bricks, etc.

- Scaffolds and scaffold components must be inspected for visible defects before each shift by a competent person, and after each occurrence that could affect a scaffold's integrity (such as being struck by a crane).
- Maintain scaffolding and materials (e.g., paint roller extensions, building material) at least 10 feet (3 meters) from overhead power lines for voltages of 50 kV or less, and 10 feet (3 meters) plus 0.4 inch (1.0 cm) for every 1 kV over 50 kV.
- All portable electric equipment must be protected by ground-fault circuit interrupters (GFCIs) or an assured equipment grounding conductor program.

### **8.49.3 Suspended Scaffolding**

Suspension scaffolds consist of one or more platforms suspended by ropes or other non-rigid means from an overhead structure(s). The common requirements for suspended scaffolds are addressed here; the competent person shall ensure scaffold type specific requirements are included as applicable.

- CH2M HILL staff erecting, dismantling, or working on scaffolds must complete the CH2M HILL 10-Hour Construction Safety Awareness training course. Staff must also and receive project-specific scaffold training from a qualified person. Staff shall not use scaffold systems for which they have not been trained.
- A CH2M HILL scaffold competent person shall be assigned to direct and oversee the erection, dismantling, and use of scaffolds. Additionally, they must inspect scaffolds each day prior to use.
- Scaffolds shall be designed by a qualified person and shall be constructed and loaded in accordance with that design.
- A tag and permit system shall be used to inform personnel of the construction status of the scaffold. At a minimum, the system used shall inform users when a scaffold is complete and safe to be used and when a scaffold is under construction and is not ready to be used. When additional precautions are required to use the scaffold safely, for example, the use of fall protection systems, the system shall identify the precautions to be taken. The tag or permit shall be placed at each means of access to the scaffold. The competent shall be responsible for the tag and permit system.
- A daily safety briefing shall be conducted with all scaffold personnel to discuss the work planned for the day and the HSE requirements to be followed.
- Scaffolds and scaffold components must be capable of supporting, without failure, their own weight and at least 4 times their maximum intended load.
- The site must be inspected to determine the strength of supporting structure, and for proximity of electric power lines, overhead obstructions, wind conditions, the need for overhead protection or weather protection coverings.
- Scaffolds and scaffold components must be inspected for visible defects before each shift by a competent person, and after each occurrence that could affect a scaffold's integrity (such as being struck by a crane).
- Maintain scaffolding and materials (e.g., paint roller extensions, building material) at least 10 feet (3 meters) from overhead power lines for voltages of 50 kV or less, and 10 feet (3 meters) plus 0.4 inch (1.0 cm) for every 1 kV over 50 kV.
- All portable electric equipment must be protected by ground-fault circuit interrupters (GFCIs) or an assured equipment grounding conductor program.

### **8.49.4 Fall Protection on Suspended Scaffolds**

- Each employee on a multi-point or two-point adjustable suspension scaffold must be protected by both a guardrail system and a personal fall arrest system.
- Personal fall-arrest systems used on scaffolds shall be attached by lanyard to a vertical lifeline, horizontal lifeline, or scaffold structural member.

- Guardrail systems must be installed along all open sides and ends of platforms, and must be in place before the scaffold is released for use by employees other than erection/dismantling crews.

## 8.50 Stairways and Ladders

(Reference CH2M HILL SOP HSE-214, *Stairways and Ladders*)

Below are the hazard controls and safe work practices to follow when using stairways and ladders. Ensure the requirements in the referenced SOP are followed.

- Stairway or ladder is generally required when a break in elevation of 19 inches (48.3 cm) or greater exists.
- Personnel should avoid using both hands to carry objects while on stairways; if unavoidable, use extra precautions.
- Personnel must not use pan and skeleton metal stairs until permanent or temporary treads and landings are provided the full width and depth of each step and landing.
- Ladders must be inspected by a competent person for visible defects prior to each day's use. Defective ladders must be tagged and removed from service.
- Always obey and pay attention to warning labels or stickers on the specific ladder being used.
- Ladders must be used only for the purpose for which they were designed and shall not be loaded beyond their rated capacity.
- Ladder safety training on safe use (take the Stairways and Ladders safety training module located on the VO).
- Only one person at a time shall climb on or work from an individual ladder.
- User must face the ladder when climbing; keep belt buckle between side rails.
- Ladders shall not be moved, shifted, or extended while in use.
- User must use both hands to climb; use rope to raise and lower equipment and materials.
- Straight and extension ladders must be tied off to prevent displacement.
- Ladders that may be displaced by work activities or traffic must be secured or barricaded.
- Personnel climbing ladders shall face the ladder and maintain 3 points of contact with the ladder.
- Portable ladders must extend at least 3 feet (91.5 cm) above landing surface.
- Straight and extension ladders must be positioned at such an angle that the ladder base to the wall is one-fourth of the working length of the ladder.
- Stepladders are to be used in the fully opened and locked position.
- Users are not to stand on the top two steps of a stepladder; nor are users to sit on top or straddle a stepladder.
- Fixed ladders  $\geq$  24 feet (7.3 meters) in height must be provided with fall protection devices.
- Fall protection should be considered when working from extension, straight, or fixed ladders greater than six feet (1.8 meters) from lower levels and both hands are needed to perform the work, or when reaching or working outside of the plane of ladder side rails.

## 8.51 Steel Erection

(Reference CH2M HILL SOP HSE-312, *Steel Erection*)

Below are the hazard controls and safe work practices to follow when working around or performing steel erection activities. Ensure the requirements in the referenced SOP are followed.

- Protruding reinforcing steel (rebar), onto which personnel could fall, must be guarded to eliminate the hazard of impalement.
- Structural steel loads shall not be released from the hoisting line until the members are secured with at least two bolts, or the equivalent at each connection and drawn up wrench tight.
- Tag lines shall be used for controlling loads.
- Containers shall be provided for storing or carrying rivets, bolts, and drift pins, and secured against accidental displacement when aloft.
- Air line hose sections shall be secured together, except when quick disconnect couplers are used to join sections.
- Impact wrenches used for bolting shall be provided with a locking device for retaining the socket.
- Turnbuckles shall be secured to prevent unwinding while under stress.
- Plumbing-up guys shall be removed only under the supervision of a competent person.
- Metal decking of sufficient strength shall be laid tight and secured to prevent movement.
- Provisions shall be made to secure temporary flooring against displacement. Planks shall overlap the bearing on each end by a minimum of 12 inches (30.5 cm). Wire mesh, exterior plywood, or equivalent, shall be used around columns where planks do not fit tightly.
- All unused openings in floors, temporary or permanent, shall be completely planked over or guarded.

## 8.52 Slips, Trips and Falls

### General

- Institute and maintain good housekeeping practices.
- Designate foot traffic paths in and out of sites, when necessary, to ensure paths are kept free from slip, trip, and fall hazards or to deter personnel from taking “shortcuts” where slip, trip, hazards may be.
- Mitigate icy conditions by keeping foot traffic paths clear of ice and snow.
- Watch footing as you walk to avoid trip hazards, animal holes, or other obstacles, especially in tall grassy areas.

### Muddy Conditions

- Muddy conditions present a slipping hazard. Use mats or other similar surface to work from if footing cannot be stabilized.
- Take shortened steps across muddy areas.
- Use a walking staff or other similar means to assist with balance.

### Steep Slopes/Uneven Ground/Rock and Vertical Slopes

- Be aware that escarpments can slough. Avoid these areas.
- Exercise caution in relying on rocks and trees/tree stumps to support yourself – many times they are loose.

- Whenever possible, switchback your way up/down steep areas, and maintain a slow pace with firm footing.
- Employees walking in ditches, swales and other drainage structures adjacent to roads or across undeveloped land must use caution to prevent slips and falls which can result in twisted or sprained ankles, knees, and backs.
- Whenever possible observe the conditions from a flat surface and do not enter a steep ditch or side of a steep road bed.
- If steep terrain must be negotiated coordinate with RHSM to evaluate the need for ladders or ropes to provide stability.

## 8.53 Stream Crossing

Traversing streams present significant hazards, including drowning, hypothermia, and abrasions. When crossing streams, be sure to implement the bulleted items below.

- When walking in streams, first plan the route. Look ahead for exits should there be any difficulty during the crossing, and “read” the water for spots to avoid such as drop offs, sunken logs, and tricky currents.
- Do seek out the safest route – narrow, low flow, shallow. Evaluate deeper and faster moving sections with caution. Backtracking is often dangerous or impossible once committed.
- If streams to be crossed are deeper than “knee deep”, find an alternate crossing location that is less deep.
- Streams should be crossed while facing upstream, stepping side to side, and using a sturdy walking stick. When possible, wade a stream diagonally, moving downstream. Move slowly, keeping the foot on the upstream side in the lead and pointed forward. Your rear, or anchor, foot should point downstream and be at right angles to the lead foot. Move the lead foot forward about half a step, feeling for a solid hold. Next, move the anchor foot forward the same distance – shuffle across so that your anchor foot never passes the lead. This way both feet are always in position to lend support. If you must turn around, do so toward the upstream direction.
- Don’t attempt to cross above rocky rapids or a cascade. Step on submersed rocks with great care.
- If you are working in streams, algae covered rocks should be assumed slippery until tested. Always be alert for unstable and extremely slippery rocks.
- Rocks with green moss or attached plants offer better traction or even better, look for gravel and sand pockets among the stream boulders, which are much more stable, and use a wading staff (if not carrying one, find a suitable one nearby) to steady your balance while crossing. Use a solid wading staff instead of the collapsible type.
- Be cautious of areas where there are submerged or partially submerged trees/tree branches – these can create entanglement hazards during a crossing or a “swim”.
- If streams are crossed that are deeper than “crotch deep”, personnel must use either ropes and/or wear chest waders.
- Choose the right waders (with RHSM/SC involvement).
- Footwear with felt-bottom soles are ideal for rocky bottom streams. The rough texture cuts through algae growing on the rocks and grips well. For very slippery conditions, consider studded felt soles or a slipover, studded sandal. However, felt soles do not provide good traction on muddy, slippery banks. Cleated soles work well for mud or sand bottom streams (a hard molded tread pattern similar to a hiking boot).
- Wear a wading belt with chest waiters to keep your waders from billowing out like a parachute; the currents will carry you and move you in ways you don’t want to move.
- Never wade alone.



- If the wader fills with water, don't panic. Waders full of water weigh less in water than on land and the water inside doesn't add any weight as long as you are in the water. Also a common fear is that air trapped in the waders will raise the feet higher than the head and force the face underwater is unfounded. Waders do streamline your legs and kicking is useless. Follow these steps if the waders fill with water:
  - Don't try to take them off in the water
  - In calm water, wade or swim to shore
  - In fast-moving water, ride the current:
  - Pull your feet up in front of you, bend your knees
  - Point your feet downstream (so the feet, not the head will bounce off the rocks)
  - Sculling with your hands will help direct to the nearest shallow area
  - When you reach calm water, go ashore and empty your waders
  - Don't waste energy in the vertical position going for the bottom. This position is virtually impossible to maintain and leads quickly to exhaustion (the major cause of drowning).
  - Concentrate on getting out of the water and not saving the equipment.
- The higher the elevation you are at, the steeper the stream gradient is. This means the stream can rise quicker and return to lower flow more quickly.
- Always wait out a swollen stream if at all possible.
- If you do slip into the water and are being swept downstream, don't panic. Cold water will be a shock for 2-3 seconds. Pull your knees up, face your feet downstream and lean back, using your hands as best you can to navigate and get to the bank. Keep your head up; you don't want your head underwater banging into rocks. If you stay calm, you can reach water where you can stand up or swim to the bank.
- When walking along stream banks and not entering streams, wear work boots.

## 8.54 Traffic Control

(Reference CH2M HILL SOP HSE-216, *Traffic Control*)

The following precautions must be taken when working around traffic, and in or near an area where traffic controls have been established by a sub contractor. Ensure the requirements in the referenced SOP are followed.

- Exercise caution when exiting traveled way or parking along street – avoid sudden stops, use flashers, etc.
- Park in a manner that will allow for safe exit from vehicle, and where practicable, park vehicle so that it can serve as a barrier.
- All staff working adjacent to traveled way or within work area must wear reflective/high-visibility safety vests.
- Eye protection should be worn to protect from flying debris.
- Remain aware of factors that influence traffic related hazards and required controls – sun glare, rain, wind, flash flooding, limited sight-distance, hills, curves, guardrails, width of shoulder (i.e., breakdown lane), etc.
- Always remain aware of an escape route (e.g., behind an established barrier, parked vehicle, guardrail, etc.).
- Always pay attention to moving traffic – never assume drivers are looking out for you.
- Work as far from traveled way as possible to avoid creating confusion for drivers.
- When workers must face away from traffic, a “buddy system” should be used, where one worker is looking towards traffic.
- When working on highway projects, obtain a copy of the contractor's traffic control plan.

- Work area should be protected by a physical barrier – such as a K-rail or Jersey barrier.
- Review traffic control devices to ensure that they are adequate to protect your work area. Traffic control devices should: 1) convey a clear meaning, 2) command respect of road users, and 3) give adequate time for proper traffic response. The adequacy of these devices are dependent on limited sight distance, proximity to ramps or intersections, restrictive width, duration of job, and traffic volume, speed, and proximity.
- Either a barrier or shadow vehicle should be positioned a considerable distance ahead of the work area. The vehicle should be equipped with a flashing arrow sign and truck-mounted crash cushion (TMCC). All vehicles within 40 feet (12.2 meters) of traffic should have an orange flashing hazard light atop the vehicle.
- Except on highways, flaggers should be used when 1) two-way traffic is reduced to using one common lane, 2) driver visibility is impaired or limited, 3) project vehicles enter or exit traffic in an unexpected manner, or 4) the use of a flagger enhances established traffic warning systems.
- Lookouts should be used when physical barriers are not available or practical. The lookout continually watches approaching traffic for signs of erratic driver behavior and warns workers.
- Vehicles should be parked at least 40 feet (12.2 meters) away from the work zone and traffic. Minimize the amount of time that you will have your back to oncoming traffic.
- Traffic control training module on the VO shall be completed when CH2M HILL workers who work in and around roadways and who exposed to public vehicular traffic.

## 8.55 Utilities (underground)

An assessment for underground utilities must be conducted where there is a potential to contact underground utilities or similar subsurface obstructions during intrusive activities. Intrusive activities include excavation, trenching, drilling, hand augering, soil sampling, or similar activities.

The assessment must be conducted before any intrusive subsurface activity and must include at least the following elements:

- A background and records assessment of known utilities or other subsurface obstructions.
- Contacting and using the designated local utility locating service.
- Conducting an independent field survey to identify, locate, and mark potential underground utilities or subsurface obstructions. *Note: This is independent of, and in addition to, any utility survey conducted by the designated local utility locating service above.*
- A visual survey of the area to validate the chosen location.

When any of these steps identifies an underground utility within 5 feet (1.5 meters) of intrusive work, then non-aggressive means must be used to physically locate the utility before a drill rig, backhoe, excavator or other aggressive method is used.

Aggressive methods are never allowed within 2 feet of an identified high risk utility (see paragraph below).

Any deviation from these requirements must be approved by the Responsible HS Manager and the Project Manager.

### Background and Records Assessment of Known Utilities

Identify any client- or location-specific permit and/or procedural requirements (e.g., dig permit or intrusive work permit) for subsurface activities. For military installations, contact the Base Civil Engineer and obtain the appropriate form to begin the clearance process.

Obtain available utility diagrams and/or as-built drawings for the facility.

Review locations of possible subsurface utilities including sanitary and storm sewers, electrical lines, water supply lines, natural gas lines, fuel tanks and lines, communication lines, lighting protection systems, etc. Note: Use caution in relying on as-built drawings as they are rarely 100 percent accurate.

Request that a facility contact with knowledge of utility locations review and approve proposed locations of intrusive work.

### **Designated Local Utility Locating Service**

Contact your designated local utility locating service (e.g., Dig-Safe, Blue Stake, One Call) to identify and mark the location of utilities. Call 811 in the U.S. or go to [www.call811.com](http://www.call811.com) to identify the appropriate local service group. Contacting the local utility locating service is a legal requirement in most jurisdictions.

### **Independent Field Survey (Utility Locate)**

The organization conducting the intrusive work (CH2M HILL or subcontractor) shall arrange for an independent field survey to identify, locate, and mark any potential subsurface utilities in the work area. This survey is in addition to any utility survey conducted by the designated local utility locating service.

The independent field survey provider shall determine the most appropriate instrumentation/technique or combinations of instrumentation/techniques to identify subsurface utilities based on their experience and expertise, types of utilities anticipated to be present, and specific site conditions.

A CH2M HILL or subcontractor representative must be present during the independent field survey to observe the utility locate and verify that the work area and utilities have been properly identified and marked. If there is any question that the survey was not performed adequately or the individual was not qualified, then arrangements must be made to obtain a qualified utility locate service to re-survey the area. Obtain documentation of the survey and clearances in writing and signed by the party conducting the clearance. Maintain all documentation in the project file.

If the site owner (military installation or client) can provide the independent field survey, CH2M HILL or the subcontractor shall ensure that the survey includes:

- Physically walking the area to verify the work location and identify, locate, and mark underground utility locations:
- Having qualified staff available and instrumentation to conduct the locate;
- Agreeing to document the survey and clearances in writing.
- Should any of the above criteria not be met, CH2M HILL or subcontractor must arrange for an alternate independent utility locate service to perform the survey.
- The markings from utility surveys must be protected and preserved until the markings are no longer required. If the utility location markings are destroyed or removed before intrusive work commences or is completed, the PM, SC, or designee must notify the independent utility locate service or the designated local utility locating service to resurvey and remark the area.

### **Visual Assessment before and during Intrusive Activities**

Perform a “360 degree” assessment. Walk the area and inspect for utility-related items such as valve caps, previous linear cuts, patchwork in pavement, hydrants, manholes, utility vaults, drains, and vent risers in and around the dig area.

The visual survey shall include all surface landmarks, including manholes, previous liner cuts, patchwork in pavement, pad-mounted transformers, utility poles with risers, storm sewer drains, utility vaults, and fire hydrants.

If any unanticipated items are found, conduct further research before initiating intrusive activities and implement any actions needed to avoid striking the utility or obstruction.

### Subsurface Activities within 5 feet of an Underground Utility or if there is Uncertainty

When aggressive intrusive activities will be conducted within 5 feet (1.5 meters) of an underground utility or when there is uncertainty about utility locations, locations must be physically verified by non-aggressive means such as air or water knifing, hand digging, or human powered hand augering. Non-conductive tools must be used if electrical hazards may be present. If intrusive activities are within 5 feet (1.5 meters) and parallel to a marked existing utility, the utility location must be exposed and verified by non-aggressive methods every 100 feet (30.5 meters). Check to see if the utility can be isolated during intrusive work.

### Intrusive Activities within 2 feet of an Underground Utility

Use non-aggressive methods (hand digging, vacuum excavation, etc.) to perform intrusive activities within 2 feet of a high risk utility (i.e., a utility that cannot be de-energized or would cause significant impacts to repair/replace). Hazardous utilities shall be de-energized whenever possible.

### Spotter

A spotter shall be used to monitor for signs of utilities during advancement of intrusive work (e.g., sudden change in advancement of auger or split spoon, presence of pea gravel or sand in soils, presence of concrete or other debris in soils, refusal of auger or excavating equipment). If any suspicious conditions are encountered stop work immediately and contact the PM or RHSM to evaluate the situation. The spotter must have a method to alert an operator to stop the intrusive activity (e.g., air horn, hand signals).

## 8.56 Utilities (overhead)

### Proximity to Power Lines

It must be determined whether equipment operations including, positioning, and traveling will occur in proximity to power lines within 20 feet (6.1 meters) for line voltage up to 350 kilo volts (kV), and within 50 feet (15.2 meters) for line voltage between 350 kV to 1000 kV. For power lines over 1000 kV, the distance must be determined by the utility/operator or qualified registered professional engineer in electrical power transmission and distribution.

Operations adjacent to overhead power lines are PROHIBITED unless one of the following conditions is satisfied:

- Power has been shut off, positive means (such as lockout) have been taken to prevent the lines from being energized, lines have been tested to confirm the outage, and the utility company has provided a signed certification of the outage.
- The minimum clearance from energized overhead lines is as shown in the table below, or the equipment will be repositioned and blocked to ensure that no part, including cables, can come within the minimum clearances shown in the table.

#### MINIMUM DISTANCES FROM POWERLINES

Powerlines Nominal System Kv	Minimum Required Distance, Feet (Meters)
0-50	10 (3.0)
50-200	15 (4.6)
201-350	20 (6.1)
351-500	25 (7.6)
501-750	35 (10.7)
751-1000	45 (13.7)
Over 1000	Established by utility owner/operator or by a professional engineer in electrical power transmission/distribution

(These distances have been determined to eliminate the potential for arcing based on the line voltage.)

- The power line(s) has been isolated through the use of insulating blankets which have been properly placed by the utility. If insulating blankets are used, the utility will determine the minimum safe operating distance; get this determination in writing with the utility representative's signature.
- All inquiries regarding electric utilities must be made in writing and a written confirmation of the outage/isolation must be received by the PM prior to the start of work.

## 8.57 Vacuum Trucks

When CH2M HILL personnel are exposed to vacuum truck operations, the following safe work practices/hazard controls shall be implemented.

- A pre-operational check should be performed on the vacuum truck before use. Operators must be familiar with the operator's manual.
- Operators of vacuum trucks should be trained and familiar with the equipment. At least one person should be operating the boom and one person signaling and assisting the boom operator.
- Before use the hoses and lines should be checked for fraying and connections checked for leakage. Proper selection of hose diameter and type of hose (smooth bore hose vs. corrugated hose) is vital before the job is performed.
- The amount of force produced by a vacuum truck can kill hose operators. If an eight-inch hose gets stuck to your body at 27 inches Hg, it can be fatal. All trucks should be equipped with an emergency release the hose operator or assistant can initiate if a worker gets sucked into a hose. A remote release, manual release near the truck and an inline "T" should be present on the truck. The inline "T" should be installed between the very last section of hose and the working section of hose. The cord that releases the in-line relief should be tethered to the hose handler's belt or a watch buddy should be nearby holding the cord and ready to relieve in the event of an emergency. Operators should never attempt to vacuum hose with any part of their body to check for suction.
- Tanks on vacuum trucks are a confined space. Before the tank is opened and anyone enters a confined space assessment should be performed.
- The truck should always be grounded before use. The static electricity produced when sucking materials into the system can produce a spark and ignite anything in the tank or hose. Use of a grounding wire will prevent static electric explosions. Vacuum trucks should not be used to pump mixtures with a flash point less than 140 degrees or less - this is an accepted industry standard - refer to the operators manual for more information.
- When positioning truck to work, be extra cautions of personnel and other equipment located next to truck.
- Wet and dry material should not be mixed in the tank.
- When swinging the boom, change directions slowly.
- Do not load dump body beyond rated capacity. Be aware of possible load surge when turning or braking.

## 8.58 Vinyl Chloride

(Reference CH2M HILL, SOP HSE-512, *Vinyl Chloride*)

Vinyl Chloride is considered a "Confirmed Human Carcinogen." Vinyl Chloride has a mild, sweet, chloroform-like odor.

CH2M HILL is required to control employee workplace exposure to vinyl chloride when personal exposures are at or above 1.0 ppm as an 8-hour time-weighted average (TWA) or above 5.0 ppm short term exposure limit (STEL), by implementing a program that meets the requirements of the Occupational Safety and Health Administration

(OSHA) Vinyl Chloride standard, 29 CFR 1910.1017. The elements of the CH2M HILL vinyl chloride program include the following:

- Exposure monitoring
- Methods of control, including personal protective equipment (PPE) and respirators
- Medical surveillance
- Training on hazards of vinyl chloride and control measures (includes project-specific training and the computer-based training on CH2M HILL's Virtual Office, *Vinyl Chloride*)
- Record keeping requirements

If air monitoring indicates there is potential exposure at the action level concentrations above, notify the RHSM to ensure the above have been adequately addressed. Other exposure control measures include:

- Do not enter regulated work areas unless training, medical monitoring, and PPE requirements established by the competent person have been met.
- Do not eat, drink, smoke, chew tobacco or gum, or apply cosmetics in regulated areas.
- Respiratory protection and other exposure controls selection shall be based on the most recent exposure monitoring results obtained from the competent person.
- Review the fact sheet included as an attachment to the SOP.

## 8.59 Welding and Cutting

(Reference CH2M HILL, SOP-314, *Welding and Cutting*)

Below are the hazard controls and safe work practices to follow when working around or performing welding and cutting. Ensure the requirements in the referenced SOP are followed.

- Workers designated to operate welding and cutting equipment shall have been properly instructed and qualified to operate such equipment.
- Before welding or cutting is permitted, the area shall be inspected by the individual responsible for authorizing the welding or cutting operation. The authorization, preferably in the form of a written permit, shall detail precautions to be taken before work is to begin.
- Suitable fire extinguishing equipment shall be immediately available in the work area.
- Flame-resistant blankets shall be used to control sparks produced by welding and cutting operations from traveling to lower levels or adjacent surfaces.
- If the valve on a fuel-gas cylinder is found to leak around the valve stem, the valve shall be closed and the gland nut tightened. If this does not stop the leak, the cylinder is to be tagged and removed from service.
- Nothing should be placed on top of a cylinder or manifold that will damage it or interfere with the quick closing of the valve.
- Flow gages and regulators shall be inspected prior to use and removed from cylinders when not in use.
- Hoses, leads, and cables shall be not be routed through doorways and walkways unless covered, elevated, or protected from damage. Where hoses, leads, and cables pass through wall openings, adequate protection shall be provided to prevent damage.
- Flash arresters shall be installed at the torch handle.
- Arc welding electrodes shall not be struck against compressed gas cylinders to strike an arc.

- All arc welding or cutting operations shall be shielded by noncombustible or flame resistant screens to protect employees or other persons in the vicinity from the direct rays of the arc.
- Proper ventilation shall be provided so as to maintain the level of contaminants in the breathing zone of welders below applicable permissible exposure limits.
- Minimum personal protective equipment includes the following:
  - Safety-toed shoes or boots, hard hats, and safety glasses
  - Body protection (such as gloves, coveralls, or Tyvek) when chemical hazards exist
  - Hearing protection when working in close proximity to loud equipment and machinery
  - Protective clothing and gloves to prevent burns
  - Suitable eye protective equipment for the type of welding or cutting performed
  - Opaque screens to block arc flash from arc welding and cutting operations
  - Mechanical ventilation systems for welding and cutting operations conducted in enclosed or confined spaces
  - Air monitoring or sampling equipment to evaluate airborne concentrations of welding and cutting contaminants
  - Respiratory protection when airborne concentrations of contaminants exceed regulatory limits

### **8.59.1 Compressed Gas Cylinders**

- Cylinders being transported, moved, or stored shall have valve protection caps installed. When transported by motor vehicle, hoisted, or carried, cylinders shall be in the vertical position.
- Oxygen cylinders in storage shall be separated from fuel-gas cylinders or combustible materials by a minimum of 20 feet (6.1 meters) or by a noncombustible barrier at least 5 feet (1.5 meters) high having a fire resistant rating of at least one half hour.
- Inside of buildings, cylinders shall be stored in well-ventilated, dry locations at least 20 feet (6.1 meters) from highly combustible materials. Cylinders should be stored in definitely assigned places away from elevators, stairs, or gangways. Assigned storage areas shall be located where cylinders will not be knocked over or damaged.
- During use, cylinders shall be kept far enough away from the actual welding and cutting operations to prevent sparks, hot slag, or flames from reaching them. When impractical, fire resistant shields shall be provided.
- Cylinders containing oxygen or fuel-gas shall not be taken into confined spaces.
- If cylinders are frozen, warm (not boiling) water shall be used to thaw them.

### **8.59.2 Welding and Cutting Equipment**

- Fuel-gas and oxygen hoses shall be easily distinguishable from each other and shall not be interchangeable between fuel-gas and oxygen.
- Hoses shall be inspected at the beginning of each shift. Defective hoses shall be removed from service.
- Hose couplings shall be designed to be disconnected with a rotary motion, not by straight pull.
- Torches shall be inspected at the beginning of each shift for leaking valves, connections, and couplings. Defective torches shall be removed from service.
- Torches shall be ignited with friction lighters, not open flames or hot work.

### 8.59.3 Arc Welding and Cutting

- Only manual electrode holders that are designed for arc welding or cutting and are capable of safely handling the maximum rated current shall be used.
- Only cable that is free from repair or splices for a minimum distance of 10 feet (3 meters) from the cable's attachment to the electrode holder shall be used.
- Any current-carrying part that arc welders or cutters grip in their hand, as well as the outer surfaces of the jaws of the holder, shall be fully insulated against the maximum voltage encountered to ground.
- The frames of arc welding or cutting machines shall be grounded. Grounding circuits, other than by means of the structure, shall be checked to ensure that the circuit between the ground and the grounded power conductor has resistance low enough to permit sufficient current flow to cause the fuse or circuit breaker to interrupt the current.
- When electrode holders are left unattended, the electrode shall be removed and the holder placed where it cannot harm employees.
- Hot electrode holders shall not be dipped in water to cool them.
- When welding or cutting is stopped for any appreciable length of time, or before the welding or cutting machine is moved, the power shall be shut off.
- Before starting welding or cutting operations, all connections to the machine shall be checked.

### 8.59.4 Toxic Fumes and Gases

- General mechanical or local exhaust ventilation shall be provided when welding or cutting in a confined space.
- Contaminated air exhausted from the work area shall be discharged into the open air or otherwise clear of the intake air.
- Other employees exposed to the same atmosphere as the welder or cutter shall be protected in the same manner as the welder or cutter.
- In enclosed spaces, all surfaces covered with toxic preservative coatings shall be stripped to a distance of at least four inches from the area to be heated, or the worker shall be protected with an air-line respirator.
- Welding or cutting in an enclosed space shall be performed with local exhaust ventilation or air-line respirators when the following metal bases, fillers, or coatings are involved: lead, cadmium, mercury, zinc, stainless steel, or beryllium.
- Employees welding or cutting in the open air and who are exposed to the metals noted above shall be protected with filter-type respirators; however, when working with beryllium, the employee shall be protected with an air-line respirator.

### 8.59.5 Fire Prevention

- When the potential for an explosive atmosphere exists in the immediate area of welding or cutting operations, air monitoring instruments shall be used to verify that no explosive atmosphere is present before or during welding or cutting operations.
- When welding or cutting on walls, floors, or ceilings, the same precautions shall be taken on the opposite side as for the welding or cutting side.
- Whenever openings or cracks in the floor, walls, or doorways cannot be closed, precautions shall be taken to prevent combustible materials in other areas from coming in contact with sparks.
- To prevent fire in enclosed spaces, the gas supply to the torch shall be shut off at some point outside the enclosed space whenever the torch is not in use or is left unattended.



- Drums or hollow structures that have contained toxic or flammable substances shall be filled with water or thoroughly cleaned, ventilated, and tested before welding or cutting on them.
- Before heat is applied to a drum, container, or structure, a vent or opening shall be provided to release built-up pressure during the application of heat.
- Before welding or cutting on any surface covered by a preservative coating whose flammability is unknown, a competent person shall test to determine its flammability.
- Preservative coatings shall be considered highly flammable when scrapings burn rapidly.
- When preservative coatings are determined to be highly flammable, they shall be stripped from the area to be heated.

## 8.60 Working Around Material Handling Equipment

When CH2M HILL personnel are exposed to material handling equipment, the following safe work practices/hazard controls shall be implemented:

- Never approach operating equipment from the rear. Always make positive contact with the operator, and confirm that the operator has stopped the motion of the equipment.
- Never approach the side of operating equipment; remain outside of the swing and turning radius.
- Maintain distance from pinch points of operating equipment.
- Never turn your back on any operating equipment.
- Never climb onto operating equipment or operate contractor/subcontractor equipment.
- Never ride contractor/subcontractor equipment unless it is designed to accommodate passengers and equipped with firmly attached passenger seat.
- Never work or walk under a suspended load.
- Never use equipment as a personnel lift; do not ride excavator buckets or crane hooks.
- Always stay alert and maintain a safe distance from operating equipment, especially equipment on cross slopes and unstable terrain.
- Wear a high visibility safety vest or high visibility clothing.

## 8.61 Working Alone

(Reference CH2M HILL Core Standard, *Working Alone*)

Personnel can only be tasked to work alone by the Project Manager who shall assess potential hazards and appropriate control measures, with assistance from the Responsible Health and Safety Manager (RHSM).

“Lone workers” with an accountability system in place is permitted, depending on the hazards presented during the execution of the task. Reference the “Lone Worker Protocol” included as an attachment to the project safety plan.

Only limited operations task are permitted to be performed alone. Activities that are not permitted to be performed by a lone worker include the following:

- Working at heights (e.g., on ladders, lifts, scaffolding);
- Energy isolation (e.g., lockout/tagout);
- Any entry into a confined space; and
- Work involving electricity or other hazardous equipment (e.g., chainsaws);
- Work over or near water; and
- Working in an area where there is an increased potential for violence.

An AHA shall be developed that shall include:

- Type or nature of work to be conducted by the lone worker;
- Location of the work
- Length of time the worker will be working alone; and
- Any characteristics of the individual working alone which may increase the risk to the worker (e.g., medical conditions).

The employee working alone shall at all times be equipped with a working voice communication device such as a cellular phone, satellite phone, personal alarms, or two-way radio to check-in to their project contact (s) at pre-determined times. For some work, a satellite-based communication system may be appropriate (i.e., a “SPOT” device).

### Call-In System for Lone Worker Accountability

The employee working alone shall at all times be equipped with a working voice communication device such as a cellular phone, satellite phone, personal alarms, or two-way radio to check-in to their project contact (s) at pre-determined times.

Each time before going into the field, a “Call in contact Form” shall be completed by the lone worker and given to the call-in office worker contact prior to going into the field.

During field work, a copy of “The Lone Worker Call-In Contact Form” should be maintained by both the “Office Contact Worker” and the field-worker (“Lone Worker”). Lone Worker and Office Contact Worker must both have cell phones and each other’s phone number, plus one other alternate phone number.

Lone worker shall call the office contact worker when he/she has arrived on-site, before exiting his/her vehicle. On this phone call, a time shall be arranged for a “check-in” call to be made by the field worker, based on duration of task. On each “check-in” call a time should be arranged for the next “check-in” call. Document these times on the form.

Lone Worker shall carry his or her cell-phone throughout the field event and put the ringer on its loudest setting as wind or other noise can muffle the sound. If, for any reason the cell-phone becomes inoperable, the field-worker shall immediately stop work, leave the site and find an alternative method of contacting the Office Contact Worker to verify their safety and to inform them of the issue.

Work shall not proceed in the field until the Lone Worker has a working device that provides communication with the Office Contact Worker.

Upon completion of work activities, Lone Worker should pack up all materials and prepare to leave site. Then, before starting the engine of the vehicle to leave site, the Lone Worker should contact the office-worker and inform him or her that work is complete and that he or she is leaving the site. A final call shall be made by the lone work to the office worker to confirm he/she has reached their destination.

If at any time, the Office Contact Worker does not receive a “check-in” call at the scheduled time he/she should attempt to contact Lone Worker. If no contact is made then the Office Contact Worker should contact the facility contact person to check on the Lone Worker.

If no contact is made with the Lone Worker, then the Office Contact Worker shall contact the PM and/or RHSM to let them know they are going to inform emergency services inform that there is a possible emergency and instruct them to go to the field location and assist the Lone Worker. The Office Contact Worker will provide to emergency services the Lone Worker’s name, their last known location, vehicle description and their contact information.

Call in contact Form shall be completed by lone worker and given to call in contact prior to going into the field. Refer to the “Lone Worker Protocol” attached to the project safety plan.

## 8.62 Working Over Water

If any activities pose a risk to drowning implement the following during the activity:

- Fall protection should be provided to prevent personnel from falling into water. Where fall protection systems are not provided and the danger of drowning exists, U.S. Coast Guard-approved personal flotation devices (PFDs), or a life jacket, shall be worn.
- Provide employees with an approved (USCG for U.S. operations) life jacket or buoyant work vest.
  - Employees should inspect life jackets or work vests daily before use for defects. Do not use defective jackets or vests.
- Post ring buoys with at least 90 feet (27.4 meters) of 3/8-inch solid-braid polypropylene (or equal) line next to the work area. If the work area is large, post extra buoys 200 feet (61 meters) or less from each other.
- Provide at least one life saving skiff, immediately available at locations where employees are working over or adjacent to water.
  - Ensure the skiff is in the water and capable of being launched by one person and is equipped with both motor and oars.
- Designate at least one employee on site to respond to water emergencies and operate the skiff at times when there are employees above water.
  - If the designated skiff operator is not within visual range of the water, provide him or her with a radio or provide some form of communication to inform them of an emergency.
  - Designated employee should be able to reach a victim in the water within three to four minutes.
- Ensure at least one employee trained in CPR and first aid is on site during work activities.

## SECTION 9

# Physical Hazards and Controls

---

Physical hazards include exposure to temperature extremes, sun, noise, and radiation. If you encounter a physical hazard that has not been identified in these Guidelines or the project safety plan, contact the RHSM so hazard controls can be addressed.

## 9.1 Noise

(Reference CH2M HILL SOP HSE-108, *Hearing Conservation*)

CH2M HILL is required to control employee exposure to occupational noise levels of 85 decibels, A-weighted, (dBA) and above by implementing a hearing conservation program that meets the requirements of the OSHA Occupational Noise Exposure standard, 29 CFR 1910.95. A noise assessment may be conducted by the RHSM or designee based on potential to emit noise above 85 dBA and also considering the frequency and duration of the task.

- Areas or equipment emitting noise at or above 90dBA shall be evaluated to determine feasible engineering controls. When engineering controls are not feasible, administrative controls can be developed and appropriate hearing protection will be provided.
- Areas or equipment emitting noise levels at or above 85 dBA, hearing protection must be worn.
- Employees exposed to 85 dBA or a noise dose of 50 percent must participate in the Hearing Conservation program including initial and annual (as required) audiograms.
- The RHSM will evaluate appropriate controls measures and work practices for employees who have experienced a standard threshold shift (STS) in their hearing.
- Employees who are exposed at or above the action level of 85 dBA are required to complete the online Noise Training Module located on CH2M HILL's virtual office.
- Hearing protection will be maintained in a clean and reliable condition, inspected prior to use and after any occurrence to identify any deterioration or damage, and damaged or deteriorated hearing protection repaired or discarded.
- In work areas where actual or potential high noise levels are present at any time, hearing protection must be worn by employees working or walking through the area.
- Areas where tasks requiring hearing protection are taking place may become hearing protection required areas as long as that specific task is taking place.
- High noise areas requiring hearing protection should be posted or employees must be informed of the requirements in an equivalent manner and a copy of the OSHA standard 29 CFR 1910.95 shall be posted in the workplace.

## 9.2 Ultraviolet Radiation (sun exposure)

Health effects regarding ultraviolet (UV) radiation are confined to the skin and eyes. Overexposure can result in many skin conditions, including erythema (redness or sunburn), photoallergy (skin rash), phototoxicity (extreme sunburn acquired during short exposures to UV radiation while on certain medications), premature skin aging, and numerous types of skin cancer. Implement the following controls to avoid sunburn.

### **Limit Exposure Time**

- Rotate staff so the same personnel are not exposed all of the time.
- Limit exposure time when UV radiation is at peak levels (approximately 2 hours before and after the sun is at its highest point in the sky).
- Avoid exposure to the sun, or take extra precautions when the UV index rating is high.

### **Provide Shade**

- Take lunch and breaks in shaded areas.
- Create shade or shelter through the use of umbrellas, tents, and canopies.
- Fabrics such as canvas, sailcloth, awning material and synthetic shade cloth create good UV radiation protection.
- Check the UV protection of the materials before buying them. Seek protection levels of 95 percent or greater, and check the protection levels for different colors.

### **Clothing**

- Reduce UV radiation damage by wearing proper clothing; for example, long sleeved shirts with collars, and long pants. The fabric should be closely woven and should not let light through.
- Head protection should be worn to protect the face, ears, and neck. Wide-brimmed hats with a neck flap or “Foreign Legion” style caps offer added protection.
- Wear UV-protective sunglasses or safety glasses. These should fit closely to the face. Wrap-around style glasses provide the best protection.

### **Sunscreen**

- Apply sunscreen generously to all exposed skin surfaces at least 20 minutes before exposure, allowing time for it to adhere to the skin.
- Re-apply sunscreen at least every 2 hours, and more frequently when sweating or performing activities where sunscreen may be wiped off.
- Choose a sunscreen with a high sun protection factor (SPF). Most dermatologists advocate SPF 30 or higher for significant sun exposure.
- Waterproof sunscreens should be selected for use in or near water, and by those who perspire sufficiently to wash off non-waterproof products.
- Check for expiration dates, because most sunscreens are only good for about 3 years. Store in a cool place out of the sun.
- No sunscreen provides 100 percent protection against UV radiation. Other precautions must be taken to avoid overexposure.

## **9.3 Temperature Extremes**

(Reference CH2M HILL SOP HSE-211, *Heat and Cold Stress*)

Each employee is responsible for the following:

- Recognizing the symptoms of heat or cold stress;
- Taking appropriate precautionary measures to minimize their risk of exposure to temperature extremes (see following sections); and

- Communicating any concerns regarding heat and cold stress to their supervisor or SC.

### 9.3.1 Heat

California has a specific heat illness prevention regulation that must be implemented. This includes,

- Having enough water onsite so that each worker can consume at a minimum, one quart per hour per shift.
- Frequent reminders and/or water breaks shall be taken so that each person can consume enough water.
- Access to shade (i.e., blockage from direct sunlight) shall be provided at all times and shall be reasonably close to the work area. Keep in mind that a vehicle or other enclosed area with no air conditioning is NOT considered shade. Must be a well-ventilated area or have air conditioning.
- Workers suffering from heat illness-related symptoms OR if needed for preventative recovery shall be provided access to shade for at least 5 minutes, or longer, for recovery. (if heat related symptoms are occurring, contact the RHSM).
- Training on risk factors, signs and symptoms of heat illness, importance of hydration and acclimatization, and importance of reporting symptoms and what to do in case of heat illness emergency, and contacting emergency medical services (see sections that follow).

Heat-related illnesses are caused by more than just temperature and humidity factors.

**Physical fitness** influences a person's ability to perform work under heat loads. At a given level of work, the more fit a person is, the less the physiological strain, the lower the heart rate, the lower the body temperature (indicates less retained body heat—a rise in internal temperature precipitates heat injury), and the more efficient the sweating mechanism.

**Acclimatization** is a gradual physiological adaptation that improves an individual's ability to tolerate heat stress. Acclimatization requires physical activity under heat-stress conditions similar to those anticipated for the work. With a recent history of heat-stress exposures of at least two continuous hours per day for 5 of the last 7 days to 10 of the last 14 days, a worker can be considered acclimatized. Its loss begins when the activity under those heat-stress conditions is discontinued, and a noticeable loss occurs after 4 days and may be completely lost in three to four weeks. Because acclimatization is to the level of the heat-stress exposure, a person will not be fully acclimatized to a sudden higher level; such as during a heat wave.

**Dehydration** reduces body water volume. This reduces the body's sweating capacity and directly affects its ability to dissipate excess heat.

The ability of a body to dissipate heat depends on the ratio of its surface area to its mass (surface area/weight).

**Heat dissipation** is a function of surface area, while heat production depends on body mass. Therefore, overweight individuals (those with a low ratio) are more susceptible to heat-related illnesses because they produce more heat per unit of surface area than if they were thinner. Monitor these persons carefully if heat stress is likely.

When wearing **impermeable clothing**, the weight of an individual is not as important in determining the ability to dissipate excess heat because the primary heat dissipation mechanism, evaporation of sweat, is ineffective.

#### SYMPTOMS AND TREATMENT OF HEAT STRESS

	Heat Syncope	Heat Rash	Heat Cramps	Heat Exhaustion	Heat Stroke
Signs and Symptoms	Sluggishness or fainting while standing erect or immobile in heat.	Profuse tiny raised red blister-like vesicles on affected areas, along with prickling sensations during heat exposure.	Painful spasms in muscles used during work (arms, legs, or abdomen); onset during or after work hours.	Fatigue, nausea, headache, giddiness; skin clammy and moist; complexion pale, muddy, or flushed; may faint on standing; rapid thready pulse and low blood pressure; oral temperature normal or low	Red, hot, dry skin; dizziness; confusion; rapid breathing and pulse; high oral temperature.

**SYMPTOMS AND TREATMENT OF HEAT STRESS**

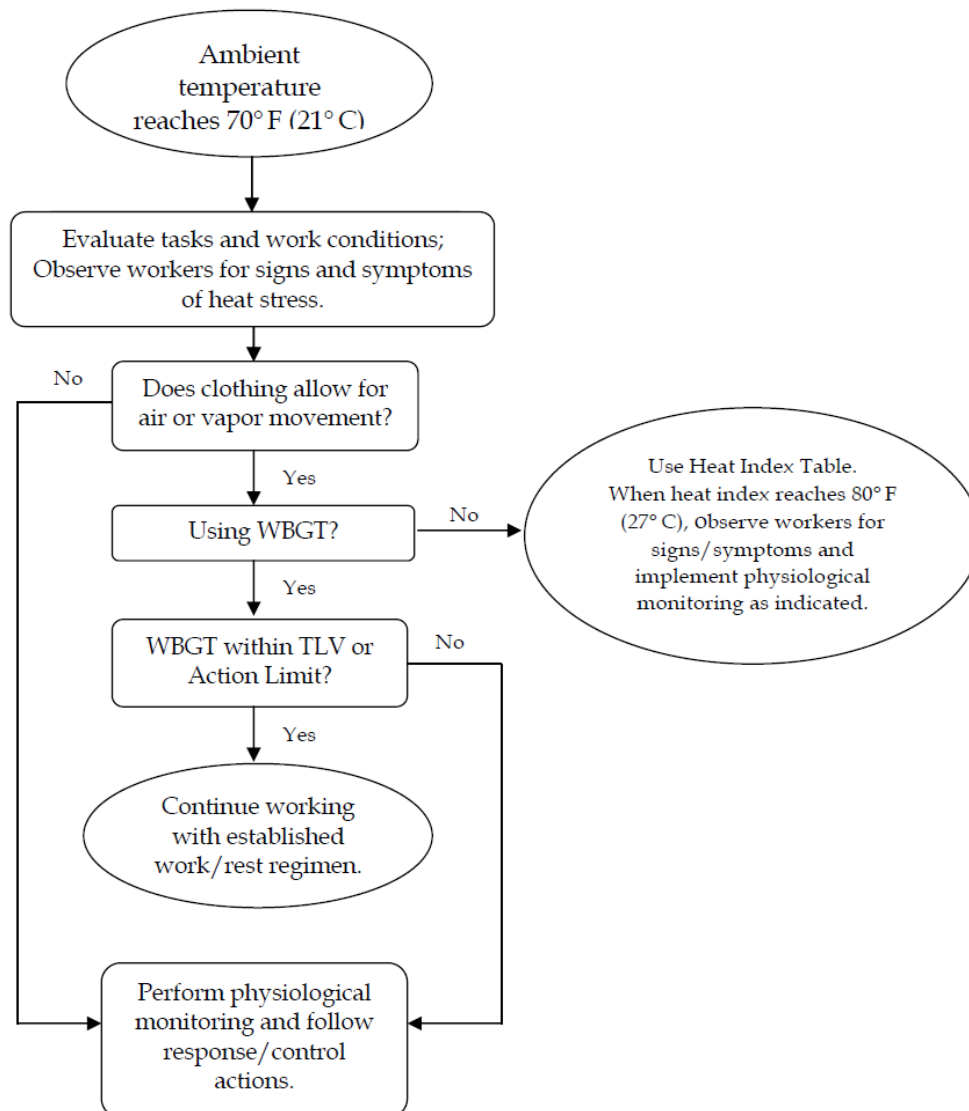
Treatment	Remove to cooler area. Rest lying down. Increase fluid intake. Recovery usually is prompt and complete.	Use mild drying lotions and powders, and keep skin clean for drying skin and preventing infection.	Remove to cooler area. Rest lying down. Increase fluid intake.	Remove to cooler area. Rest lying down, with head in low position. Administer fluids by mouth. Seek medical attention.	Cool rapidly by soaking in cool—but not cold—water. Call ambulance, and get medical attention immediately!
-----------	---	--	--	--	--

**Precautions**

- Drink 16 ounces of water before beginning work. Disposable cups and water maintained at 50°Fahrenheit (10 degrees Celsius [C]) to 60°Fahrenheit (F) (15.6 degrees C) should be available. Under severe conditions, drink 1 to 2 cups every 20 minutes, for a total of 1 to 2 gallons (7.5 liters) per day. Remind employees to drink water throughout their work shift.
- Do not use alcohol in place of water or other nonalcoholic fluids. Decrease your intake of coffee and caffeinated soft drinks during working hours.
- Acclimate to site work conditions by slowly increasing workloads; for example, do not begin site work with extremely demanding activities. Closely monitor employees during their first 14 days of work in the field.
- Supervisors and SCs must continually observe employees throughout the work shift for signs and symptoms of heat stress or illness. Employees must monitor themselves for heat stress as well as observe their co-workers.
- Effective communication must be maintained with employees throughout the work shift either by voice, observation, or electronic device.
- Use cooling devices, such as cooling vests, to aid natural body ventilation. These devices add weight, so their use should be balanced against efficiency.
- Use mobile showers or hose-down facilities to reduce body temperature and cool protective clothing.
- Conduct field activities in the early morning or evening and rotate shifts of workers, if possible.
- Avoid direct sun whenever possible, which can decrease physical efficiency and increase the probability of heat stress. Take regular breaks in a cool, shaded area. Use a wide-brim hat or an umbrella when working under direct sun for extended periods.
- Provide adequate shade to protect personnel against radiant heat (sun, flames, hot metal).
- Use portable fans for convection cooling or in extreme heat conditions, an air-conditioned rest area when needed.
- In hot weather, rotate shifts of workers.
- Maintain good hygiene standards by frequent changes of clothing and showering. Clothing should be permitted to dry during rest periods. Persons who notice skin problems should consult medical personnel.
- Brief employees initially before the project work begins and routinely as part of the daily safety briefing, on the signs and symptoms of heat-relatedness illnesses, precautions and emergency procedures to follow as described in the project safety plan.
- Observe one another for signs of heat stress. PREVENTION and communication is key.

## Thermal Stress Monitoring

### Thermal Stress Monitoring Flow Chart



### Permeable Clothing – Monitoring Using WBGT

A Wet Bulb Globe Thermometer (WBGT) is the established and preferred means of measuring the environmental factors associated with heat stress and for providing indication of when physiological monitoring or rest regimens should be incorporated into the work schedule. The WBGT is the composite temperature used to estimate the effect of temperature, humidity, wind speed, and **solar radiation** on the human body.

When permeable work clothes are worn (street clothes or clothing ensembles over modesty clothes), physiological monitoring may be required based on the outcome of the WBGT measurements, taking into account the clothing adjustment factors. Use of the WBGT should generally begin when the heat index reaches 80° F (27° C) as indicated in the Heat Index Table below, or when workers exhibit symptoms of heat stress as indicated above.

If the WBGT is within the TLV (acclimatized workers) or Action Limit (acclimatized workers) per the tables below, then work may continue while maintaining the established work/rest regimen. If the WBGT reading meets or



exceeds either the TLV or Action Level for a work/rest regimen of 15 minutes work and 45 minutes rest, then physiological monitoring will be implemented.

#### Screening Criteria for TLV and Action Limit for Heat Stress Exposure

Allocation of work in a cycle of work and recovery	TLV (WBGT Values in °F/°C) (Acclimatized Workers)				Action Limit (WBGT Values in °F/°C) (Acclimatized Workers)			
	Light	Moderate	Heavy	Very Heavy	Light	Moderate	Heavy	Very Heavy
75-100%	88/31	82/28	—	—	82/28	77/25	—	—
50-75%	88/31	84/29	82/28	—	83/29	79/26	75/24	—
25-50%	90/32	86/30	84/29	82/28	85/30	81/27	78/26	76/25
0-25%	91/33	89/32	87/31	86/30	86/30	84/29	82/28	81/27

#### Work Category Descriptions:

Light	Sitting or standing with light manual work using hands or arms; occasional walking.
Moderate	Sustained moderate hand, arm, and leg work; light pushing and pulling; normal walking.
Heavy	Intense arm and trunk work, carrying, shoveling, manually sawing, pushing and pulling heavy loads, walking at a fast pace.
Very Heavy	Very intense activity at fast to maximum pace.

#### Notes:

WBGT values are expressed to the nearest degree.

“—”Dashes indicate the need for physiological monitoring because screening criteria are not recommended for this type of work.

#### Clothing Adjustment Factors for Some Clothing Ensembles\*

Clothing Type	Addition to WBGT °F/°C
Work Clothes (sleeved shirt and pants)	0/0
Cloth (woven material) coveralls	0/0
Double-layer woven clothing	5.4/3
Polypropylene coveralls	0.9/0.5
Limited Use Vapor barrier coveralls	19.8/11

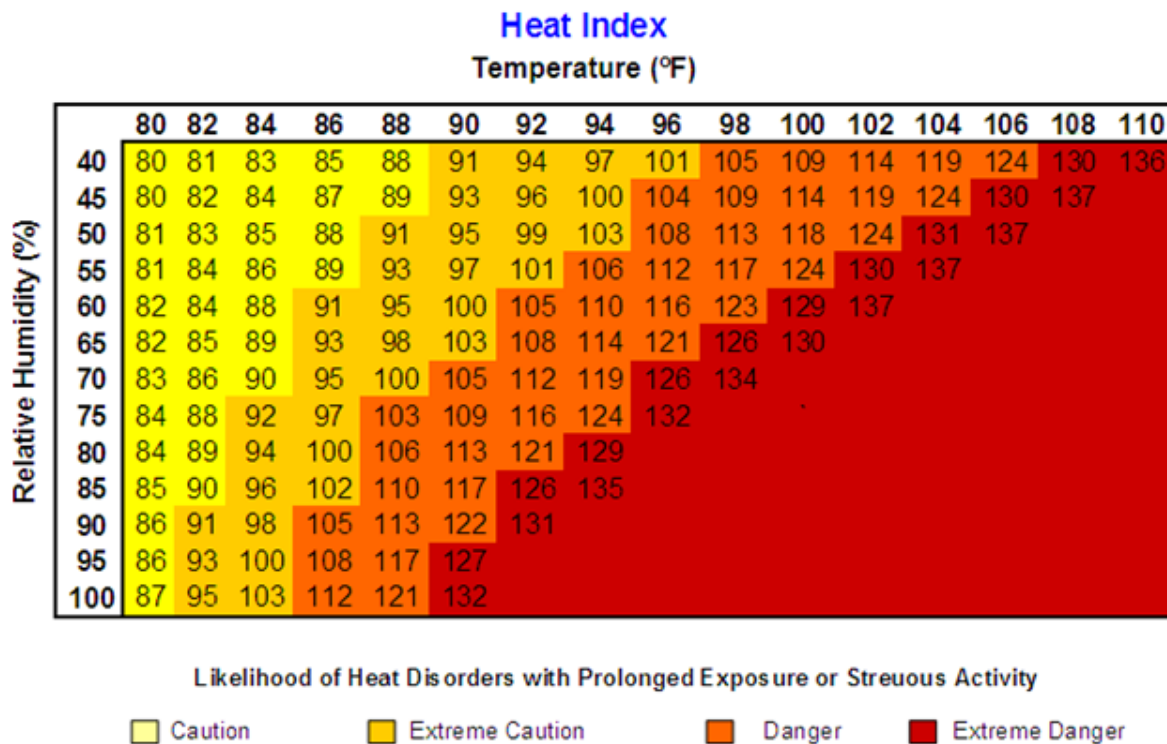
\* These values must not be used for completely encapsulating (impermeable) coveralls/suits. Coveralls assume that only modesty clothing is worn beneath.

### Thermal Stress Monitoring – Permeable or Impermeable Clothing

When **permeable work clothes** are worn (street clothes or clothing ensembles over street clothes), regularly observe workers for signs and symptoms of heat stress and implement physiological monitoring as indicated below. This should start when the heat index reaches 80° F (27° C) [see Heat Index Table below], or sooner if workers exhibit symptoms of heat stress indicated in the table above. These heat index values were devised for shady, light wind conditions; exposure to full sunshine can increase the values by up to 15°F (8°C). Also, strong winds, particularly with very hot, dry air, can be extremely hazardous.

When wearing **impermeable clothing** (e.g., clothing doesn't allow for air or water vapor movement such as Tyvek), physiological monitoring as described below shall be conducted when the ambient temperature reaches

70° F (21° C) or sooner when climatic conditions may present greater risk of heat stress combined with wearing unique variations of impermeable clothing, or workers exhibit symptoms of heat stress



Heat Index	Possible Heat Disorders	Minimum Frequency of Physiological Monitoring
80°F - 90°F (27°C - 32°C)	Fatigue possible with prolonged exposure and/or physical activity	Conduct initial monitoring as baseline and observe workers for signs of heat stress and implement physiological monitoring if warranted.
90°F - 105°F (32°C - 41°C)	Sunstroke, heat cramps, or heat exhaustion possible with prolonged exposure and/or physical activity	Conduct initial monitoring as baseline, then at least every hour, or sooner, if signs of heat stress are observed.
105°F - 130°F (41°C - 54°C)	Sunstroke, heat cramps, or heat exhaustion likely, and heat stroke possible with prolonged exposure and/or physical activity.	Conduct initial monitoring as baseline, then every 30 minutes or sooner if signs of heat stress are observed.
130°F or Higher (54°C or Higher)	Heat/Sunstroke highly likely with continued exposure.	Conduct initial monitoring as baseline, then every 15 minutes or sooner if signs of heat stress are observed.

Source: National Weather Service

## Physiological Monitoring and Associated Actions

For employees wearing permeable clothing, follow the minimum frequency of physiological monitoring listed in the Heat Index Table.

For employees wearing impermeable clothing, physiological monitoring should begin initially at a 15 minute interval, then if the employee's heart rate or body temperature is within acceptable limits, conduct the subsequent physiological monitoring at 30 minutes, and follow the established regimen protocol below.

When physiological monitoring is required, use either radial pulse or aural temperature and follow actions below:

- The sustained heart rate during the work cycle should remain below 180 beats per minute (bpm) minus the individual's age (e.g., 180 – 35 year old person = 145 bpm). The sustained heart rate can be estimated by measuring the heart rate at the radial pulse for 30 seconds as quickly as possible prior to starting the rest period.
- The heart rate after one minute rest period should not exceed 120 beats per minute (bpm).
- If the heart rate is higher than 120 bpm after the FIRST minute into the rest period, the next work period should be shortened by 33 percent, while the length of the rest period stays the same.
- If the pulse rate still exceeds 120 bpm at the beginning of the next rest period, the following work cycle should be further shortened by 33 percent.
- Continue this procedure until the rate is maintained below 120 bpm after the FIRST minute into the rest period.

Alternately, the body temperature can be measured, either oral or aural (ear), before the workers have something to drink.

- If the oral or aural temperature exceeds 99.6° F (37.6 ° F) at the beginning of the rest period, the following work cycle should be shortened by 33 percent.
- Continue this procedure until the oral or aural (ear) temperature is maintained below 99.6 ° F (37.6° C). While an accurate indication of heat stress, oral temperature is difficult to measure in the field, however, a digital aural (aural) thermometer is easy to obtain and inexpensive to purchase.

### **Procedures for when Heat Illness Symptoms are Experienced**

- Always contact the RHSM when any heat illness related symptom is experienced so that controls can be evaluated and modified, if needed.
- In the case of cramps, reduce activity, increase fluid intake, move to shade until recovered.
- In the case of all other heat-related symptoms (fainting, heat rash, heat exhaustion), and if the worker is a CH2M HILL worker, contact the occupational physician at 1-866-893-2514 and immediate supervisor.
- In the case of heat stroke symptoms, call 911, have a designee give location and directions to ambulance service if needed, follow emergency medical treatment section of the project safety plan.
- Follow the Incident Notification, Reporting, and Investigation section of these Guidelines.

## **9.3.2 Cold**

### **General**

Low ambient temperatures increase the heat lost from the body to the environment by radiation and convection. In cases where the worker is standing on frozen ground, the heat loss is also due to conduction.

Wet skin and clothing, whether because of water or perspiration, may conduct heat away from the body through evaporative heat loss and conduction. Thus, the body cools suddenly when chemical protective clothing is removed if the clothing underneath is perspiration soaked.

Movement of air across the skin reduces the insulating layer of still air just at the skin's surface. Reducing this insulating layer of air increases heat loss by convection.

Non-insulating materials in contact or near-contact with the skin, such as boots constructed with a metal toe or shank, conduct heat rapidly away from the body.

Certain common drugs, such as alcohol, caffeine, or nicotine, may exacerbate the effects of cold, especially on the extremities. These chemicals reduce the blood flow to peripheral parts of the body, which are already high-risk

areas because of their large surface area to volume ratios. These substances may also aggravate an already hypothermic condition.

### Precautions

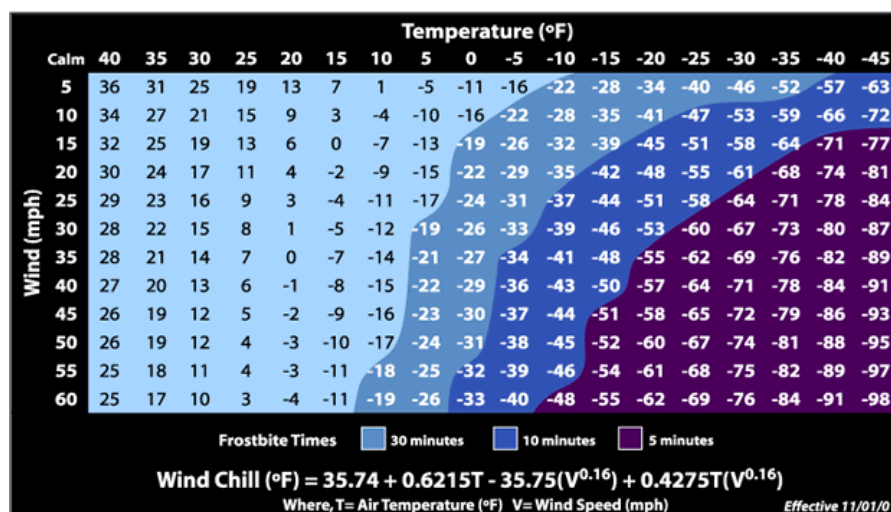
- Be aware of the symptoms of cold-related disorders, and wear proper, layered clothing for the anticipated fieldwork. Appropriate rain gear is a must in wet weather.
- Consider monitoring the work conditions and adjusting the work schedule using guidelines developed by the U.S. Army (wind-chill index) and the National Safety Council (NSC).
- Wind-Chill Index (below) is used to estimate the combined effect of wind and low air temperatures on exposed skin. The wind-chill index does not take into account the body part that is exposed, the level of activity, or the amount or type of clothing worn. For those reasons, it should only be used as a guideline to warn workers when they are in a situation that can cause cold-related illnesses.
- Persons who experience initial signs of immersion foot, frostbite, and/or hypothermia should report it immediately to their supervisor/PM to avoid progression of cold-related illness.
- Observe one another for initial signs of cold-related disorders.
- Obtain and review weather forecast – be aware of predicted weather systems along with sudden drops in temperature, increase in winds, and precipitation.

### SYMPTOMS AND TREATMENT OF COLD STRESS

	Immersion (Trench) Foot	Frostbite	Hypothermia
Signs and Symptoms	Feet discolored and painful; infection and swelling present.	Blanched, white, waxy skin, but tissue resilient; tissue cold and pale.	Shivering, apathy, sleepiness; rapid drop in body temperature; glassy stare; slow pulse; slow respiration.
Treatment	Seek medical treatment immediately.	Remove victim to a warm place. Re-warm area quickly in warm—but <b>not</b> hot—water. Have victim drink warm fluids, but <b>not</b> coffee or alcohol. Do not break blisters. Elevate the injured area, and get medical attention.	Remove victim to a warm place. Have victim drink warm fluids, but <b>not</b> coffee or alcohol. Get medical attention.



## Wind Chill Chart



## SECTION 10

# Biological Hazards and Controls

---

Biological hazards are everywhere and change with the region and season. During project planning stages, ask the site Point of Contact if there are insect or other biological hazards have been noted in any of the work sites.

Biological hazards are everywhere and change with the region and season. If you encounter a biological hazard that has not been identified in the project safety plan or in these Guidelines, contact the RHSM so that hazard controls can be addressed. Whether it is contact with a poisonous plant, a poisonous snake, or a bug bite, do not take bites or stings lightly. If there is a chance of an allergic reaction or infection, or to seek medical advice on how to properly care for the injury, contact the occupational nurse at 1-866-893-2514.

## 10.1 Black Bears

Bears may inhabit wooded areas where there is scarce continuous human presence. Make your presence known—especially when vegetation and terrain make it hard to see. Make noise, sing, or talk loudly. Avoid thick brush. Try to walk with the wind at your back so your scent will warn bears of your presence.

Give bears plenty of room. Every bear has a “personal space” - the distance within which a bear feels threatened – that can be from a few feet to a few hundred feet. If you stray within that zone, a bear may act aggressively. Never approach bears, even if only out of curiosity, and never attempt to feed bears.

If a bear cannot recognize you, he may come closer or stand on his hind legs for a better view. You may try to back away slowly diagonally, but if the bear follows, stop and stand your ground. If the bear moves closer or acts aggressively, stay close together and wave your arms and shout.

Do not climb a tree – black bears are good climbers.

Do not run. Bears have been clocked at speeds of up to 35 mph, and like dogs, will chase fleeing animals. Bears often make bluff charges, sometimes up to 10 feet away without making contact. Continue waving your arms and shouting. Never imitate bears sounds or use high-pitched squeals.

If attacked, do not run. Clasp your hands tightly over the back of your neck or if you are carrying a backpack use it to protect your head and neck and remain still.

For Black bears, if the attack lasts for more than a few seconds, respond aggressively - use sticks, rocks, your fists or noise. Black bears will sometimes back off if they are challenged.

## 10.2 Bees and Other Stinging Insects

Bees and other stinging insects may be encountered almost anywhere and may present a serious hazard, particularly to people who are allergic.

Precautions include:

- Watching for and avoiding nests.
- Keep exposed skin to a minimum.
- Carry a kit if you have had allergic reactions in the past, and inform your supervisor and/or a buddy. When working at a remote location, ensure that first-aid kits contain over-the-counter allergy and itch medication (e.g., Benadryl, Claritin, etc.) as well as other over-the-counter medications that may not be available to aid in symptom treatment.
- If bees or other stinging insects are known to be present, determine whether additional protective clothing should be donned before entering/working in brushy areas.

- Before entering a heavily vegetated or brushy area, observe the area for several minutes to see if bees or other stinging insects may be present. If nests or individual insects are observed, retreat and inquire whether a specialist or a client service can be contacted to clear the area before work proceeds.
- Consider if heavy-weight clothing or Tyvek, or head netting would provide additional protection in areas where wasps/bees are known or suspected. Be aware of heat stress conditions additional clothing may cause.
- Use insect repellent on clothing. Wear light-colored clothing and remove bright reflective safety-colored clothing if not working near a roadway as these may attract the wasps.
- Wear fragrance-free or lightly-scented sunscreen, and body lotions. Bees are attracted to sweet scents. Avoid using floral scented soaps, shampoos, or conditioners.
- Move slowly and calmly through vegetated areas and try to avoid major disturbance of vegetation as wasps/bees often react to aggressive movement.
- If you encounter a wasp, back away slowly and calmly, do not run or swat at the insect. Wait for it to leave, or gently move or brush it off gently with a piece of paper or other light object. Do not use your hand.

If you are stung, contact the occupational nurse at 1-866-893-2514, no matter how minor it may seem. If a stinger is present, remove it as soon as possible using something with a thin, hard edge (e.g., credit card) to scrape the stinger out. Be sure to sanitize the object first with hand sanitizer, alcohol or soap and water. Wash and disinfect the wound, cover it, and apply ice. Watch for an allergic reaction if you have never been stung before. Call 911 if the reaction is severe.

## 10.3 Bird Droppings

Large amounts of bird droppings may present a disease risk. The best way to prevent exposure to fungus spores in bird droppings is to avoid disturbing it. A brief inhalation exposure to highly contaminated dust may be all that is needed to cause infection and subsequent development of fungal disease.

If disturbing the droppings or if removal is necessary to perform work, follow these controls:

- Use dust control measures (wetting with water or HEPA vacuuming) for all activities that may generate dust from the accumulated droppings.
- Wear Tyvek with hoods, disposable gloves and booties, and air-purifying respirators with a minimum N95 rating.
- Put droppings into plastic/poly bags and preferably into a 55-gallon drum to prevent bag from ripping.

## 10.4 Cactus

Cacti are present onsite. Contact with cacti can result in dermatitis as well as causing immunologic and infectious reactions. The spines can scratch the skin or induce wounds and multiple abrasions. Some cacti have glochids (hair-like spines or short prickles, generally barbed). Glochids can induce more troublesome, more persistent, dermatological manifestations such as papules or nodules.

Set up the work area to ensure avoidance of cacti. Wear leather glove if working near cacti. Keep any clothing such as jackets away from cacti as spines can become lodged into the clothing and can be contacted by the skin later. Contact the occupational nurse if cactus contact occurs.

## 10.5 Cougars/Mountain Lions

Like bears, cougars will often retreat if given the opportunity. Walking in groups and making noise will give the cougar the chance to retreat and reduce the likelihood of a sudden encounter. Be especially cautious during dusk and dawn.

If you see a cougar—do not play dead, do not run. Running may trigger an attack. Face the cougar and retreat slowly maintaining eye contact. If the cougar continues advancing, raise your arms above your head to make yourself look larger than normal. This may help to intimidate the cougar. Sometimes aggressive yelling and rock throwing may scare it off.

If attacked, fight back with whatever is at hand (without turning your back)—people have utilized rocks, jackets, garden tools, tree branches, and even bare hands to turn away cougars.

## 10.6 Coyotes

While far from domesticated, coyotes show little fear of humans and have become comfortable living in close proximity to our communities. Although they tend to do most of their hunting after dusk, coyotes can be active at any time. Under normal circumstances, a coyote is not a danger to humans. They are, however, territorial and will respond aggressively if they or their family are threatened.

If you encounter a coyote that behaves aggressively, you have probably gotten too close to its prey or its family. Try to scare the coyote by yelling and waving your arms. Throw rocks, sticks or other objects. Do not turn away and run.

## 10.7 Feral Dogs

Avoid all dogs – both leashed and stray. Do not disturb a dog while it is sleeping, eating, or caring for puppies. If a dog approaches to sniff you, stay still. An aggressive dog has a tight mouth, flattened ears and a direct stare. If you are threatened by a dog, remain calm, do not scream and avoid eye contact. If you say anything, speak calmly and firmly. Do not turn and run, try to stay still until the dog leaves, or back away slowly until the dog is out of sight or you have reached safety (e.g., vehicle). If attacked, retreat to vehicle or attempt to place something between you and the dog. If you fall or are knocked to the ground, curl into a ball with your hands over your head and neck and protect your face. If bitten, contact the occupational nurse at 1-866-893-2514. Report the incident to the local authorities.

## 10.8 Feral Pigs

There are 4 million feral swine in over 39 states, with populations in Texas, Florida and throughout the southeastern United States. They have also been noted in California, Oregon, Nebraska, Kansas, Michigan, and Ohio. Although some of the animals have a distinctive “wild boar” appearance, others may look no different than many breeds of domestic hogs.

Feral pigs or hogs have been known to attack human beings. Perhaps the greater risk, though, is that of contracting a disease from an infected hog. People can catch undulant fever from feral hogs infected with swine brucellosis.

Feral hogs have excellent senses of smell and hearing and normally avoid contact with humans, so making noise, and alerting them to your presence most of the time will help you avoid an encounter. There are occasions of hogs chasing hunters up trees, but these are rare, isolated instances. The vast majority of hogs flee from humans. However, should you find yourself nose-to-snout with an angry pig, the best defense is to climb the nearest tree. If the pig charges, sidestep quickly, taking care to avoid the swing of its tusks and promptly find a tree to scamper up.

## 10.9 Fire Ants

There are several types of fire ants in the United States that can cause painful bites and allergic reactions. Fire ants aggressively defend their nests by stinging several times after climbing on their victims. Large ant mounds are easily visible, but there can be smaller mounds or nests with little “worked” soil that can be stepped on inadvertently. They can also be under rocks, wood or other debris. Implement the following when fire ants are observed:

- Be aware of fire ants and take care not to stand on ant nests;
- Use insect repellents on clothing and footwear to temporarily discourage ants from climbing; and
- Tuck pants into socks.

If stung, get away from the area you are standing on, briskly brush off ants—wash affected area with soap. Call the occupational nurse.

## 10.10 Hantavirus

Hantavirus pulmonary syndrome (HPS) is a disease caused by a virus which can be transmitted from certain rodents to humans and is prevalent throughout the United States. Avoid disturbing rodent nests. Contact is most likely to occur when there is a current rodent infestation in things like control boxes, storage sheds, wellheads, remediation equipment, or trailers. Once excreted into the environment by the rodent, hantaviruses can survive in the environment and remain infectious for a period of 2-3 days. Ultraviolet rays in sunlight inactivate hantaviruses.

Nesting material and droppings must be removed if work is necessary in a rodent-infested area. PPE for removal shall include:

- Tyvek coveralls;
- Rubber boots or disposable shoe covers;
- Rubber, latex, or vinyl gloves;
- Respiratory protection such as a full face or half-mask air-purifying respirator with a high-efficiency particulate air (HEPA) filter; and
- Protective goggles if wearing a half-mask respirator.

Spray any urine, droppings, and nesting materials with either a bleach and water solution (1 parts bleach to 9 parts water) or a household disinfectant prepared according to the label instructions for dilution and disinfection time. Soak well and let stand for 15 minutes. Use a paper towel or rag to pick up the materials and dispose of them.

Mop floors after spraying them using bleach and water solution or a disinfectant. Dirt floors can be sprayed with either bleach and water solution or a disinfectant.

Personal protective gear shall be decontaminated upon removal at the end of the day. All potentially infective waste material (including respirator filters) from clean-up operations shall be double-bagged in plastic bags.

### Symptoms of HPS

Symptoms develop between 14 and 31 days after exposure to infected rodents and include fatigue, fever, and muscle aches, especially the large muscle groups—thighs, hips, back and sometimes shoulders. About half of all HPS patients also experience headaches, dizziness, chills and/or abdominal pain. Four to 10 days after the initial phase of the illness, late symptoms of HPS may appear. These include coughing and shortness of breath. If you develop symptoms suggestive of HPS, call the occupational nurse at 1-866-893-2514.

## 10.11 Hazards during Hunting Seasons

Various times of the year can be particularly hazardous for personnel working in the field. The danger is highest for our teams doing cross-country surveys of pipelines and transmission lines, but everyone doing field work should be aware of the hunting seasons that are active where you are working.

Big game hunting can be very dangerous, but also be aware of water fowl seasons and hunting seasons for less common game in your area. Work in wetlands can bring us in close proximity to these types of hunters.

If possible consider postponing field surveys so they do not coincide with hunting seasons but if you must be in the field be as visible as possible at all times.



This site gives all the different hunting seasons by state:

[www.huntinfo.org/](http://www.huntinfo.org/)

Implement the following if hunting may be a hazard:

- Do not wear kaki, brown or tan clothing, wear high visibility colors including hats and vests;
- Avoid wearing white or light colored scarves, gloves, handkerchiefs (a woman wearing white mittens hanging laundry was shot and killed as bad hunter shot at flash of white);
- When carrying white plans, field data sheets etc. keep them in binder or backpack;
- Wear your safety vest at all times including standing by car/truck;
- Wear a safety hat/cap or put florescent markers on hard hats;
- Be alert particularly in early mornings and at end of day when most hunters are present;
- Avoid being in field altogether at dawn or dusk - start a little later in the morning and make sure you get out of the field earlier;
- Stop at local hardware or convenience market and pick up hunter safety gloves, caps, rolls of tape etc. All the stores carry them and they are cheap visual protection.
- Make your presence known, such as slamming car doors, honk horn, talk loudly when getting out to a field site; and
- Stop and survey your surroundings. Many hunters are up in tree stands.

## 10.12 Leeches

Leeches are bloodsucking aquatic or terrestrial worms. They can crawl through or over your socks or brush onto you from shrubbery. They carry no disease and there is low risk of significant blood loss. Leech bites do not hurt since they release an anesthetic, but they can bleed profusely due to an anticoagulant they release to facilitate the flow of blood.

### Possible Complications

- Some people suffer allergic reaction from leech bites and require urgent medical care. Symptoms include an ulcer infection, itchy rash, red blotches or an itchy rash over the body, swelling around the lips or eyes, feeling faint or dizzy, and difficulty breathing. If you experience any of these symptoms, seek medical attention immediately.

### Prevention options

- The best protection against leeches is covering up and using tropical strength insect repellent on socks and clothing.
- Use anti leech socks and fit over outer garments which served as a barrier.
- Various reports suggest applying salt, dettol spray, bath soap, eucalyptus oil or lemon juice to your skin.
- Inspect your body after leaving leech-infested waters or area, removing them promptly.

### First Aid

- Locate the head with a sucker attached to the wound. It will be the narrow end of leech's body.
- Use your fingernail or other flat, blunt object to break the seal of the oral sucker at which point the leech's jaws will detach. Repeat with the posterior end.
- Quickly flick the leech away before it bites you again and reattaches.

- Treat the wound with soap and water and antiseptic wipes; then bandage to stop bleeding.
- Do not just pull off the leech as this may cause a severe wound and the jaws may stay imbedded in the skin
- If the leech has attached to an orifice such ear, nose or mouth use salt or strong (drinkable) alcohol to cause it to release before it expands.
- Apply pressure to the area and a cold pack to reduce pain or swelling.
- The wound normally itches as it heals, but should not be scratched, as this may complicate healing and introduce other infections. Apply an antihistamine if necessary to reduce itching.
- If assisting a bitten person, use the usual protective universal precautions to protect against blood borne pathogens
- Call the occupational nurse.

## 10.13 Mosquito Bites

Due to the recent detection of the West Nile Virus in the southwestern United States it is recommended that preventative measures be taken to reduce the probability of being bitten by mosquitoes whenever possible. Mosquitoes are believed to be the primary source for exposure to the West Nile Virus as well as several other types of encephalitis. The following guidelines should be followed to reduce the risk of these concerns for working in areas where mosquitoes are prevalent:

- Stay indoors at dawn, dusk, and in the early evening;
- Wear long-sleeved shirts and long pants whenever you are outdoors;
- Spray clothing with repellents containing permethrin or N,N-diethyl-meta-toluamide (DEET) since mosquitoes may bite through thin clothing;
- Apply insect repellent sparingly to exposed skin. An effective repellent will contain 35 percent DEET. Repellents may irritate the eyes and mouth, so avoid applying repellent to the hands; and
- Whenever you use an insecticide or insect repellent, be sure to read and follow the manufacturer's DIRECTIONS FOR USE, as printed on the product.

Vitamin B and "ultrasonic" devices are NOT effective in preventing mosquito bites.

### Symptoms of Exposure to the West Nile Virus

Most infections are mild, and symptoms include fever, headache, and body aches, occasionally with skin rash and swollen lymph glands. More severe infection may be marked by headache, high fever, neck stiffness, stupor, disorientation, coma, tremors, convulsions, muscle weakness, paralysis, and, rarely, death.

The West Nile Virus incubation period is from 3 to 15 days.

Contact the project RHSM with questions, and immediately report any suspicious symptoms to your supervisor, PM, and contact the occupational nurse at 1-866-893-2514.

## 10.14 Poison Ivy, Poison Oak, and Poison Sumac

Poison ivy, poison oak, and poison sumac typically are found in brush or wooded areas. They are more commonly found in moist areas or along the edges of wooded areas. Shrubs are usually 12 to 30 inches high, or can also be a tree-climbing vine, with triple leaflets and short, smooth hair underneath. Plants are red and dark green in spring and summer, with yellowing leaves anytime especially in dry areas. Leaves may achieve bright reds in fall, but plants lose its (yellowed, then brown) leaves in winter, leaving toxic stems. All parts of the plant remain toxic throughout the seasons. These plants contain urushiol a colorless or pale yellow oil that oozes from any cut or

crushed part of the plant, including the roots, stems and leaves and causes allergic skin reactions when contacted. The oil is active year round.

Become familiar with the identity of these plants (see below). Wear protective clothing that covers exposed skin and clothes. Avoid contact with plants and the outside of protective clothing. If skin contacts a plant, wash the area with soap and water immediately. If the reaction is severe or worsens, seek medical attention.

**Poison Ivy**



**Poison Sumac**



**Poison Oak**



Contamination with poison ivy, sumac or oak can happen through several pathways, including:

- Direct skin contact with any part of the plant (even roots once above ground foliage has been removed).
- Contact with clothing that has been contaminated with the oil.
- Contact from removing shoes that have been contaminated (shoes are coated with urushiol oil).
- Sitting in a vehicle that has become contaminated.
- Contact with any objects or tools that have become contaminated.
- Inhalation of particles generated by weed whacking, chipping, vegetation clearing.

If you must work on a site with poison ivy, sumac or oak the following precautions are necessary:

- Do not drive vehicles onto the site where it will come into contact with poison ivy, sumac or oak. Vehicles which need to work in the area, such as drill rigs or heavy equipment must be washed as soon as possible after leaving the site.
- All tools used in the poison ivy, sumac or oak area, including those used to cut back poison oak, surveying instruments used in the area, air monitoring equipment or other test apparatus must be decontaminated before they are placed back into the site vehicle. If on-site decontamination is not possible, use plastic to wrap any tools or equipment until they can be decontaminated.
- Personal protective equipment, including Tyvek coveralls, gloves, and boot covers must be worn. PPE must be placed into plastic bags and sealed if they are not disposed immediately into a trash receptacle.
- As soon as possible following the work, shower to remove any potential contamination. Any body part with suspected or actual exposure should be washed with Zanol, Tecnu or other product designed for removing urushiol. If you do not have Zanol or Tecnu wash with cold water. Do not take a bath, as the oils can form and invisible film on top of the water and contaminate your entire body upon exiting the bath.
- Tecnu may also be used to decontaminate equipment.
- Use IvyBlock or similar products to prevent poison oak, ivy and sumac contamination. Check with the closest CH2M HILL warehouse to see if these products are available. Follow all directions for application.
- If you do come into contact with one of these poisonous plants and a reaction develops, contact your supervisor and the occupational nurse 1-866-893-2514. Be aware that in some instances, there can be a delay between contact with poisonous plants and the symptoms. If you are working near poison ivy or other

poisonous plants and feel a mild skin irritation, apply Zanafel/Technu immediately and contact the occupational nurse.

## 10.15 Scorpions

Scorpions usually hide during the day and are active at night. They may be hiding under rocks, wood, or anything else lying on the ground. Some species may also burrow into the ground. Most scorpions live in dry, desert areas; however, some species can be found in grasslands, forests, and inside caves.

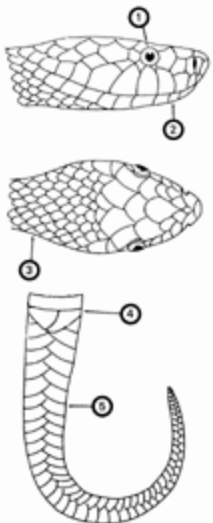
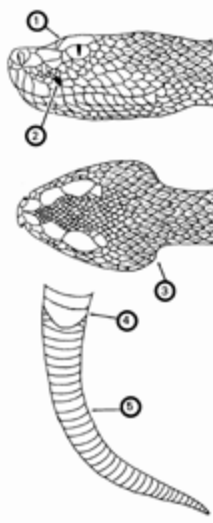
When entering an area that has the potential to contain scorpions, the following PPE is recommended: long pants, long sleeved shirts with collars, leather work gloves and leather work boots. Reaching into enclosures or recesses without prior visual inspection is not recommended. Thoroughly inspect each area before accessing. Shake out clothing, jackets, shoes or boots prior to putting them on.

If you are stung by a scorpion, call the occupational nurse 1-866-893-2514 and try to note the description of the scorpion. Cleanse the sting area and apply ice.

## 10.16 Snakes

Snakes typically are found in underbrush and tall grassy areas. If you encounter a snake, stay calm and look around; there may be other snakes. Turn around and walk away on the same path you used to approach the area. If bitten by a snake, wash and immobilize the injured area, keeping it lower than the heart if possible. Call the occupational nurse at 1-866-893-2514 immediately. Do not apply ice, cut the wound, or apply a tourniquet. Try to identify the type of snake: note color, size, patterns, and markings. Below is a guide to identifying poisonous snakes from non-poisonous snakes.

### Identification of Poisonous Snakes

Major Identification Features Non-venomous Snake	Major Identification Features Venomous Snake
<ol style="list-style-type: none"> <li>1. Round pupils</li> <li>2. No sensing pit</li> <li>3. Head slightly wider than neck</li> <li>4. Divided anal plate</li> <li>5. Double row of scales on the underside of the tail</li> </ol>	<ol style="list-style-type: none"> <li>1. Elliptical pupils</li> <li>2. Sensing pit between eye and nostril</li> <li>3. Head much wider than neck</li> <li>4. Single anal plate</li> <li>5. Single scales on the underside of the tail</li> </ol>
	

## 10.17 Spiders - Brown Recluse and Widow

The Brown Recluse spider can be found most anywhere in the United States. It varies in size in shape, but the distinguishing mark is the violin shape on its body. They are typically non-aggressive. Keep an eye out for irregular, pattern-less webs that sometimes appear almost tubular built in a protected area such as in a crevice or between two rocks. The spider will retreat to this area of the web when threatened.

The Black Widow, Red Widow and the Brown Widow are all poisonous. Most have globose, shiny abdomens that are predominantly black with red markings (although some may be pale or have lateral stripes), with moderately long, slender legs. These spiders are nocturnal and build a three-dimensional tangled web, often with a conical tent of dense silk in a corner where the spider hides during the day.

### Hazard Controls

- Inspect or shake out any clothing, shoes, towels, or equipment before use.
- Wear protective clothing such as a long-sleeved shirt and long pants, hat, gloves, and boots when handling stacked or undisturbed piles of materials.
- Minimize the empty spaces between stacked materials.
- Remove and reduce debris and rubble from around the outdoor work areas.
- Trim or eliminate tall grasses from around outdoor work areas.
- Store apparel and outdoor equipment in tightly closed plastic bags.
- Keep your tetanus boosters up-to-date (every 10 years). Spider bites can become infected with tetanus spores.

If you think you have been bit by a poisonous spider, immediately call the occupational nurse at 1-866-893-2514 and follow the guidance below:

- Remain calm. Too much excitement or movement will increase the flow of venom into the blood;
- Apply a cool, wet cloth to the bite or cover the bite with a cloth and apply an ice bag to the bite;
- Elevate the bitten area, if possible;
- Do not apply a tourniquet, do not try to remove venom; and
- Try to positively identify the spider to confirm its type. If the spider has been killed, collect it in a plastic bag or jar for identification purposes. Do not try to capture a live spider—especially if you think it is a poisonous spider.

### Black Widow Red Widow Brown Widow Brown Recluse



## 10.18 Ticks

Every year employees are exposed to tick bites at work and at home putting them at risk of illness. Ticks typically are in wooded areas, bushes, tall grass, and brush. Ticks are black, black and red, or brown and can be up to one-quarter inch (6.4 mm) in size.

In some geographic areas exposure is not easily avoided. Wear tightly woven light-colored clothing with long sleeves and pant legs tucked into boots; spray only outside of clothing with permethrin or permethrin and spray skin with only DEET; and check yourself frequently for ticks.

Where site conditions (vegetation above knee height, tick endemic area) or when tasks (having to sit or kneel in vegetation) diminish the effectiveness of the other controls mentioned above, bug-out suits (check with your local or regional warehouse) or Tyvek shall be used. Bug-out suits are more breathable than Tyvek.

Take precautions to avoid exposure by including pre-planning measures for biological hazards prior to starting field work. Avoid habitats where possible, reduce the abundance through habitat disruption or application of acaricide. If these controls aren't feasible, contact your local or regional warehouse for preventative equipment such as repellants, protective clothing and tick removal kits. Use the buddy system and perform tick inspections prior to entering the field vehicle. If ticks were not planned to be encountered and are observed, do not continue field work until these controls can be implemented.

See Tick Fact Sheet attached to project safety plan for further precautions and controls to implement when ticks are present. If bitten by a tick, follow the removal procedures found in the tick fact sheet, and call the occupational nurse at 1-866-893-2514.

Be aware of the symptoms of Lyme disease or Rocky Mountain spotted fever (RMSF). Lyme disease is a rash that might appear that looks like a bull's eye with a small welt in the center. RMSF is a rash of red spots under the skin 3 to 10 days after the tick bite. In both RMSF and Lyme disease, chills, fever, headache, fatigue, stiff neck, and bone pain may develop. If symptoms appear, again contact the occupational nurse at 1-866-893-2514.

Be sure to complete an Incident Report (either use the Hours and Incident Tracking System [HITS] system on the VO) if you do come in contact with a tick.

## SECTION 11

# Personal Protective Equipment

---

(Reference CH2M HILL- SOP HSE-117, *Personal Protective Equipment*)

## 11.1 Required Personal Protective Equipment

PPE must be worn by employees when actual or potential hazards exist and engineering controls or administrative practices cannot adequately control those hazards.

A PPE assessment has been conducted by the RHSM based on project tasks (see PPE specifications below). Verification and certification of assigned PPE by task is completed by the RHSM in each project safety plan. Below are items that need to be followed when using any form of PPE:

- Employees must be trained to properly wear and maintain the PPE; if you are unsure of how to use or maintain your PPE, ask your RHSM for guidance.
- Employees must be trained in the limitations of the PPE; if you are unsure, ask your RHSM for guidance.
- In work areas where actual or potential hazards are present at any time, PPE must be worn by employees working or walking through the area;
- Areas requiring PPE should be posted or employees must be informed of the requirements in an equivalent manner;
- PPE must be inspected prior to use and after any occurrence to identify any deterioration or damage;
- PPE must be maintained in a clean and reliable condition;
- Damaged PPE shall not be used and must either be repaired or discarded; and
- PPE shall not be modified, tampered with, or repaired beyond routine maintenance.

Each project safety plan will outline PPE to be used according to task based on project-specific hazard assessment.

## 11.2 Respiratory Protection

(Reference CH2M HILL SOP HSE-121, *Respiratory Protection*)

Implement the following when using respiratory protection:

- Respirator users must have completed appropriate respirator training within the past 12 months. Level C training is required for air-purifying respirators (APR) use and Level B training is required for supplied-air respirators (SAR) and self-contained breathing apparatus (SCBA) use. Specific training is required for the use of powered air-purifying respirators (PAPR);
- Respirator users must complete the respirator medical monitoring protocol and been approved for the specific type of respirator to be used;
- Tight-fitting facepiece respirator (negative or positive pressure) users must have passed an appropriate fit test within past 12 months;
- Respirator use shall be limited to those activities identified in the safety plan. If site conditions change that alters the effectiveness of the specified respiratory protection, the RHSM shall be notified to amend the written plan;
- Tight-fitting facepiece respirator users shall be clean-shaven and shall perform a user seal check before each use;

- Canisters/cartridges shall be replaced according to the change-out schedule specified in the safety plan. Respirator users shall notify the SC or RHSM of any detection of vapor or gas breakthrough. The SC shall report any breakthrough events to the RHSM for schedule upgrade;
- Respirators in regular use shall be inspected before each use and during cleaning;
- Respirators in regular use shall be cleaned and disinfected as often as necessary to ensure they are maintained in a clean and sanitary condition;
- Respirators shall be properly stored to protect against contamination and deformation;
- Field repair of respirators shall be limited to routine maintenance. Defective respirators shall be removed from service;
- When breathing air is supplied by cylinder or compressor, the SC or RHSM shall verify the air meets Grade D air specifications; and
- The SC or designee shall complete the Self-Assessment Checklist – Respiratory Protection included in the SOP and/or in the safety plan to verify compliance with CH2M HILL's respiratory protection program.



# Worker Training and Qualification

---

## 12.1 CH2M HILL Worker Training

(Reference CH2M HILL SOP HSE-110, *Training*)

### 12.1.1 Hazardous Waste Operations Training

All employees engaging in hazardous waste operations or emergency response shall receive appropriate training as required by 29 CFR 1910.120 and 29 CFR 1926.65. At a minimum, the training shall have consisted of instruction in the topics outlined in 29 CFR 1910.120 and 29 CFR 1926.65. Personnel who have not met these training requirements shall not be allowed to engage in hazardous waste operations or emergency response activities.

#### Initial Training

General site workers engaged in hazardous waste operations shall, at the time of job assignment, have received a minimum of 40 hours of initial health and safety training for hazardous waste site operations, unless otherwise noted in the above-referenced standards.

Employees who may be exposed to health hazards or hazardous substances at treatment, storage, and disposal (TSD) operations shall receive a minimum of 24 hours of initial training to enable the employee to perform their assigned duties and functions in a safe and healthful manner.

Employees engaged in emergency response operations shall be trained to the level of required competence in accordance with 29 CFR 1910.120.

#### Three-Day Actual Field Experience

General site workers for hazardous waste operations shall have received three days of actual experience (on-the-job training) under the direct supervision of a trained, qualified supervisor and shall be documented. If the field experience has not already been received and documented at a similar site, this supervised experience shall be accomplished and documented at the beginning of the assignment of the project.

#### Refresher Training

General site workers and TSD workers shall receive 8-hours of refresher training annually (within the previous 12-month period) to maintain qualifications for fieldwork. Employees engaged in emergency response operations shall receive annual refresher training of sufficient content and duration to maintain their competencies or shall demonstrate competency in those areas at least annually.

#### Eight-Hour Supervisory Training

On site management or supervisors who will be directly responsible for, or supervise employees engaged in hazardous waste site operations, will have received at least 8 hours of additional specialized training on managing such operations. Employees designated as Safety Coordinator – Hazardous Waste are considered 8-hour HAZWOPER Site Safety Supervisor trained.

### 12.1.2 Competent Person

The term "Competent Person" is used in many OSHA and International standards and documents. OSHA defines a "competent person" as one who, by way of training and/or experience, is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them. Some standards add additional specific requirements which must be met by the competent person.

CH2M HILL's practice is that the employer responsible for directing the means and methods of an activity (typically the employer responsible for actually performing the work) is responsible for designating the qualified

competent person for that activity. This is typically a subcontractor or a third party contractor, unless CH2M HILL is actually self-performing the work.

Should CH2M HILL self-perform work and an employee needs to be designated as a competent person, the CH2M HILL site or project manager shall coordinate with the BG HSE Lead or RHSM to verify that the employee has the requisite training and experience to be identified as the competent person.

### **12.1.3 First Aid/Cardiopulmonary Resuscitation**

First aid and CPR training consistent with the requirements of a nationally recognized organization such as the American Red Cross Association or National Safety Council shall be administered by a certified trainer. A minimum of two personnel per active field operation will have first aid and CPR training. Bloodborne pathogen training located on CH2M HILL's Virtual Office is also required for those designated as first aid/CPR trained.

### **12.1.4 Safety Coordinator Training**

SCs are trained to implement the HSE program on CH2M HILL field projects. A qualified SC is required to be identified in the project safety plan for CH2M HILL field projects. SCs must also meet the requirements of the worker category appropriate to the type of field project (construction or hazardous waste). In addition, the SCs shall have completed additional safety training required by the specific work activity on the project that qualifies them to implement the HSE program (for example, fall protection, excavation).

### **12.1.5 Site-Specific Training**

Site-specific training will be addressed in the project safety plan. Prior to commencement of field activities, all field personnel assigned to a project will have completed site-specific training that will address the contents of applicable project safety plans, including the activities, procedures, monitoring, and equipment used in the site operations. Site-specific training will also include site and facility layout, potential hazards, risks associated with identified emergency response actions, and available emergency services. This training allows field workers to clarify anything they do not understand and to reinforce their responsibilities regarding safety and work operations for their particular activity.

## SECTION 13

# Medical Surveillance and Qualification

---

(Reference CH2M HILL SOP HSE-113, *Medical Surveillance*)

All site workers participating in hazardous waste operations or emergency response (HAZWOPER) will maintain an adequate medical surveillance program in accordance with 29 CFR 1910.120 or 29 CFR 1926.65 and other applicable OSHA standards. Documentation of employee medical qualification (e.g., physician's written opinion) will be maintained in the project files and made available for inspection.

## 13.1 Hazardous Waste Operations and Emergency Response

CH2M HILL personnel expected to participate in on site HAZWOPER tasks are required to have a current medical qualification for performing this work. Medical qualification shall consist of a qualified physician's written opinion regarding fitness for duty at a hazardous waste site, including any recommended limitations on the employee's assigned work. The physician's written opinion shall state whether the employee has any detected medical conditions that would place the employee at increased risk of material impairment of the employee's health from work in hazardous waste operations or emergency response, or from respirator use.

## 13.2 Respirator User Qualification

Personnel required to wear respirators must have a current medical qualification to wear respirators. Medical qualification shall consist of a qualified physician's written opinion regarding the employee's ability to safely wear a respirator in accordance with 29 CFR 1910.134.

## 13.3 Hearing Conservation

Personnel working in hazardous waste operations or operations that fall under 29 CFR 1910.95 and exposed to noise levels in excess of the 85dBA time-weighted average shall be included in a hearing conservation program that includes annual audiometric testing.

# Site-Control Plan

---

## 14.1 Site-Control Procedures

(Reference CH2M HILL SOP HSE-218, *Hazardous Waste Operations*)

Site control is established to prevent the spread of contamination throughout the site and to ensure that only authorized individuals are permitted into potentially hazardous areas.

The SC will implement site control procedures including the following bulleted items.

- Establish support, contamination reduction, and exclusion zones. Delineate with flags or cones as appropriate. Support zone should be upwind of the site. Use access control at entry and exit from each work zone.
- Establish onsite communication consisting of the following:
  - Line-of-sight and hand signals;
  - Air horn; and
  - Two-way radio or cellular telephone if available.
- Establish offsite communication.
- Establish and maintain the “buddy system.”

## 14.2 Remediation Work Area Zones

(Reference CH2M HILL SOP HSE-218 *Hazardous Waste Operations*)

A three-zone approach will be used to control areas where site contaminants exist. Access will be allowed only after verification of appropriate training and medical qualification. The three-zone approach shall include an EZ, Contamination Reduction Zone (CRZ) and a Support Zone (SZ). The three-zone approach is not required for construction work performed outside contaminated areas where control of site contamination is not a concern.

Specific work control zones shall be established as necessary during task planning. Site work zones should be modified in the field as necessary, based on such factors as equipment used, air monitoring results, environmental conditions, or alteration of work plans. The following guidelines shall be used for establishing and revising these preliminary zone designations.

### 14.2.1 Support Zone

The SZ is an uncontaminated area (trailers, offices, field vehicles, etc.) that will serve as the field support area for most operations. The SZ provides field team communications and staging for emergency response. Appropriate sanitary facilities and safety and emergency response equipment will be located in this zone. Potentially contaminated personnel/materials are not allowed in this zone. The only exception will be appropriately packaged and decontaminated materials, or personnel with medical emergencies that cannot be decontaminated.

### 14.2.2 Contamination Reduction Zone

The CRZ is established between the EZ and the SZ, upwind of the contaminated area where possible. The CRZ provides an area for decontamination of personnel, portable handheld equipment and tools, and heavy equipment. In addition, the CRZ serves as access for heavy equipment and emergency support services.

### 14.2.3 Exclusion Zone

The EZ is where activities take place that may involve exposure to site contaminants and/or hazardous materials or conditions. This zone shall be demarcated to prevent unauthorized entry. More than one EZ may be established if there are different levels of protection to be employed or different hazards that exist in the same work area.

The EZ shall be large enough to allow adequate space for the activity to be completed, including field personnel and equipment, as well as necessary emergency equipment.

The EZ shall be demarcated with some form of physical barrier or signage. The physical barrier or signage shall be placed so that they are visible to personnel approaching or working in the area. Barriers and boundary markers shall be removed when no longer needed.

#### **14.2.4 Other Controlled Areas**

Other work areas may need to be controlled due to the presence of an uncontrolled hazard, to warn workers of requirements, or to prevent unauthorized entry. Examples include general construction work areas, open excavations, high noise areas, vehicle access areas, and similar activities or limited access locations. These areas shall be clearly demarcated with physical barriers (fencing, cones, reinforced caution tape or rope) as necessary and posted with appropriate signage.

## SECTION 15

# Decontamination

---

(Reference CH2M HILL SOP HSE-218, *Hazardous Waste Operations*)

Decontamination areas will be established for work in potentially contaminated areas to prevent the spread of contamination. Decontamination areas should be located upwind of the exclusion zone where possible and should consider any adjacent or nearby projects and personnel. The SC must establish and monitor the decontamination procedures and their effectiveness. Decontamination procedures found to be ineffective will be modified by the SC. The SC must ensure that procedures are established for disposing of materials generated on the site.

No eating, drinking, or smoking is permitted in contaminated areas and in exclusion or decontamination zones. The SC should establish areas for eating, drinking, and smoking.

## 15.1 Contamination Prevention

Preventing or avoiding contamination of personnel, tools, and equipment will be considered in planning work activities at all field locations. Good contamination prevention and avoidance practices will assist in preventing worker exposure and result in a more efficient decontamination process. Procedures for contamination prevention and avoidance include the following:

- Do not walk through areas of obvious or known contamination;
- Do not directly handle or touch contaminated materials;
- Make sure there are no cuts or tears in PPE;
- Fasten all closures in suits and cover them with duct tape, if appropriate;
- Take particular care to protect any skin injuries;
- Stay upwind of airborne contamination, where possible;
- Do not eat or drink in contaminated work areas;
- Do not carry food, beverages, tobacco, or flame-producing equipment into contaminated work areas;
- Minimize the number of personnel and amount of equipment in contaminated areas to that necessary for accomplishing the work;
- Choose tools and equipment with nonporous exterior surfaces that can be easily cleaned and decontaminated;
- Cover monitoring and sampling equipment with clear plastic, leaving openings for the sampling ports, as necessary; and
- Minimize the amount of tools and equipment necessary in contaminated areas.

## 15.2 Personnel and Equipment Decontamination

Personnel exiting an EZ must ensure that they are not spreading potential contamination into clean areas or increasing their potential for ingesting or inhaling potential contaminants. Personal decontamination may range from removing outer gloves as exiting the EZ, to proceeding through an outer layer doffing station including a boot and glove wash and rinse, washing equipment, etc. Equipment that has come into contact with contaminated media must also be cleaned/decontaminated when it is brought out of the EZ.

## 15.3 Decontamination During Medical Emergencies

Standard personnel decontamination practices will be followed whenever possible. For emergency lifesaving first aid and/or medical treatment, normal decontamination procedures may need to be abbreviated or omitted. In this situation, site personnel shall accompany contaminated victims to advise emergency response personnel on potential contamination present and proper decontamination procedures.

Outer garments may be removed if they do not cause delays, interfere with treatment, or aggravate the problem. Protective clothing can be cut away. If the outer garments cannot be safely removed, a plastic barrier between the individual and clean surfaces should be used to help prevent contaminating the inside of ambulances or medical personnel. Outer garments can then be removed at the medical facility.

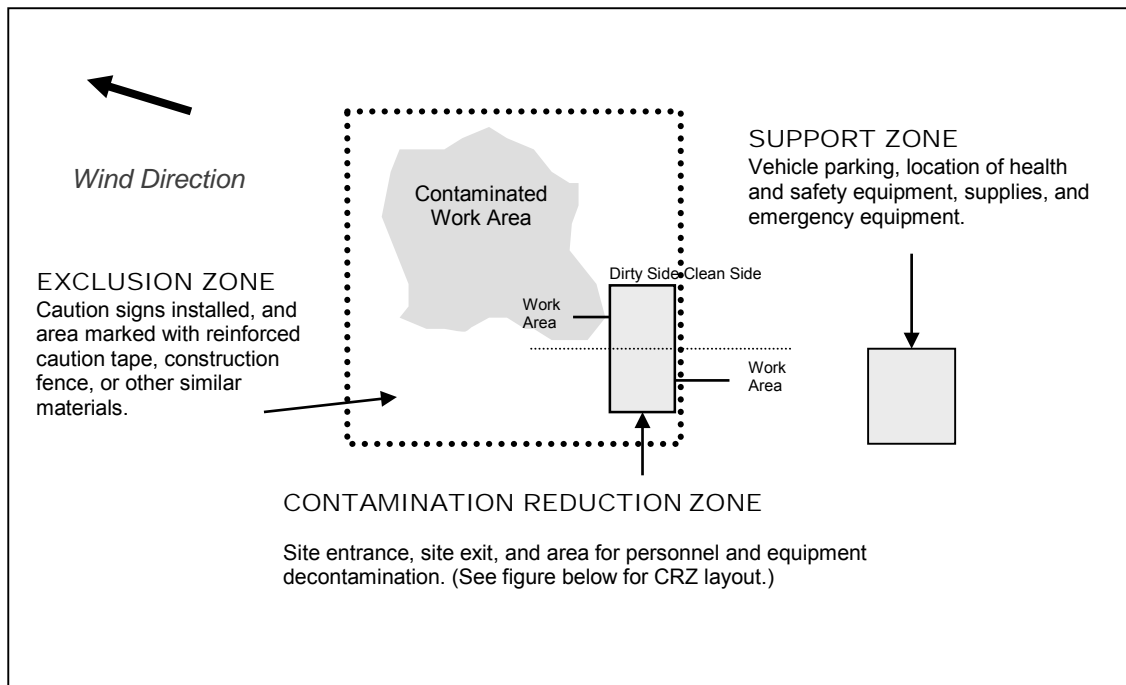
## 15.4 Waste Collection and Disposal

All contaminated material generated through the personnel and equipment decontamination processes (e.g., contaminated disposable items, gross debris, liquids, sludges) will be properly containerized and labeled, stored at a secure location, and disposed in accordance with the project plans.

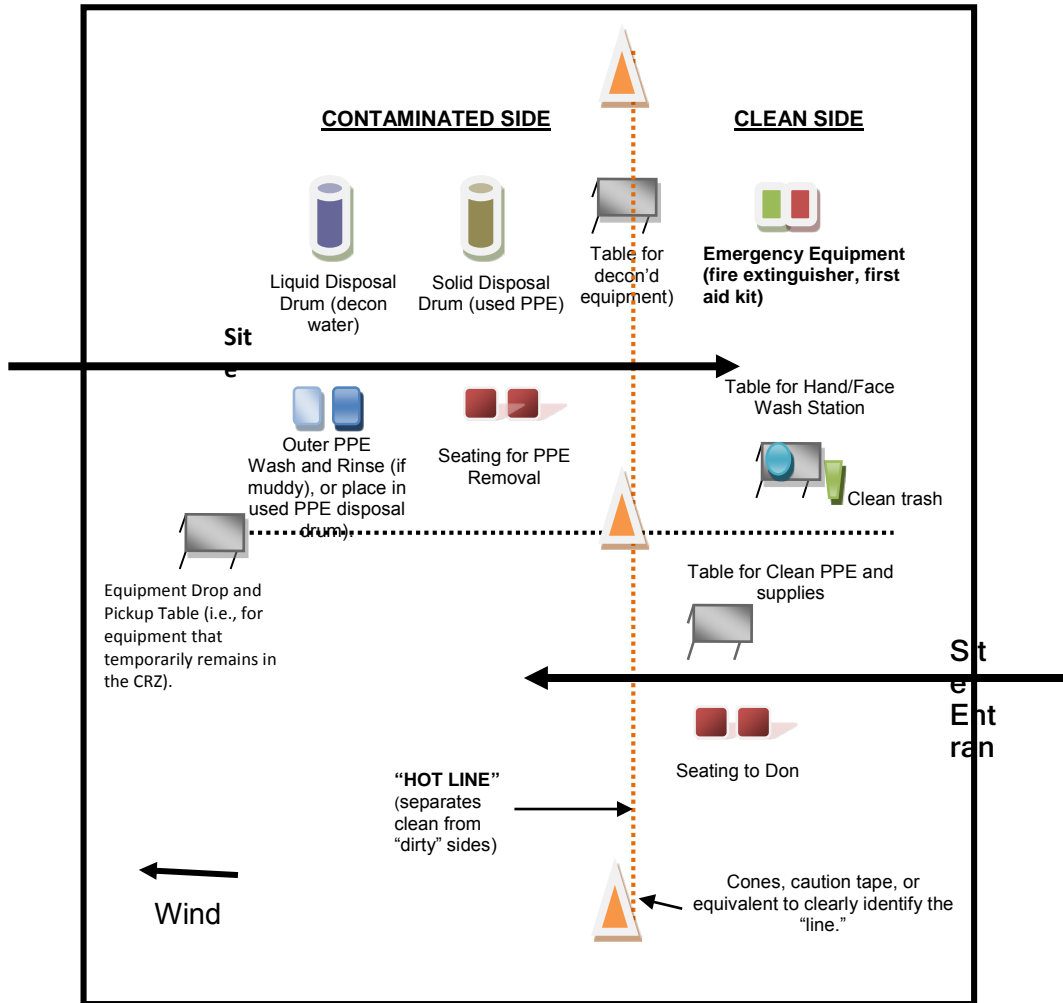
## 15.5 Diagram of Personnel-Decontamination Line

The following figure illustrates a conceptual establishment of work zones, including the decontamination line. Work zones are to be modified by the SC to accommodate task-specific requirements.

**Work Area - Set up appropriately based on wind direction**



## Typical Contamination Reduction Zone





# Emergency Preparedness

---

(Reference CH2M HILL SOP HSE-106, *Emergency Planning*)

## 16.1 Pre-Emergency Planning

The Emergency Response Coordinator (ERC), typically the SC or designee, performs the applicable pre-emergency planning tasks before starting field activities and coordinates emergency response with CH2M HILL onsite parties, the facility, and local emergency-service providers as appropriate. Pre-Emergency Planning activities performed by the ERC include:

- Review the facility emergency and contingency plans where applicable;
- Determine what onsite communication equipment is available (two-way radio, air horn);
- Determine what offsite communication equipment is needed (nearest telephone, cell phone);
- Confirm and post the “Emergency Contacts” page and route to the hospital located in this section in project trailer(s) and keep a copy in field vehicles along with evacuation routes and assembly areas. Communicate the information to onsite personnel and keep it updated;
- Field Trailers: Post “Exit” signs above exit doors, and post “Fire Extinguisher” signs above locations of extinguishers. Keep areas near exits and extinguishers clear;
- Review changed site conditions, onsite operations, and personnel availability in relation to emergency response procedures;
- Where appropriate and acceptable to the client, inform emergency room and ambulance and emergency response teams of anticipated types of site emergencies;
- Inventory and check site emergency equipment, supplies, and potable water;
- Communicate emergency procedures for personnel injury, exposures, fires, explosions, and releases;
- Rehearse the emergency response plan before site activities begin. This may include a “tabletop” exercise or an actual drill depending on the nature and complexity of the project. Drills should take place periodically but no less than once a year;
- Brief new workers on the emergency response plan; and
- The ERC will evaluate emergency response actions and initiate appropriate follow-up actions.

## 16.2 Incident Response

In fires, explosions, or chemical releases, actions to be taken include the following:

- Notify appropriate response personnel;
- Shut down CH2M HILL operations and evacuate the immediate work area;
- Account for personnel at the designated assembly area(s);
- Assess the need for site evacuation, and evacuate the site as warranted;
- Implement HSE-111, Incident Notification, Reporting and Investigation; and
- Notify and submit reports to clients as required in contract.

Small fires or spills posing minimal safety or health hazards may be controlled with onsite spill kits or fire extinguishers without evacuating the site. When in doubt evacuate. Follow the incident reporting procedures in the “Incident Notification, Reporting, and Investigation” section of these Guidelines.

## 16.3 Emergency Medical Treatment

Emergency medical treatment is needed when there is a life-threatening injury (such as severe bleeding, loss of consciousness, breathing or heart has stopped). When in doubt if an injury is life-threatening or not, treat it as needing emergency medical treatment.

- Notify 911 or other appropriate emergency response authorities as listed in the “Emergency Contacts” page located in this section.
- The ERC will assume charge during a medical emergency until the ambulance arrives or until the injured person is admitted to the emergency room.
- Prevent further injury, perform decontamination (if applicable) where feasible; lifesaving and first aid or medical treatment takes priority.
- Initiate first aid and CPR where feasible.
- Notify supervisor and if the injured person is a CH2M HILL employee, the supervisor will call the occupational nurse at 1-866-893-2514 and make other notifications as required by HSE SOP-111, *Incident Notification, Reporting and Investigation*.
- Make certain that the injured person is accompanied to the emergency room.
- Follow the Serious Incident Reporting process in HSE SOP-111, Incident Notification, Reporting and Investigation, and complete incident report using the HITS system on the VO or if not feasible, use the hard copy forms provided as an attachment to the project safety plan.
- Notify and submit reports to client as required in contract.

## 16.4 Evacuation

- Evacuation routes, assembly areas, and severe weather shelters (and alternative routes and assembly areas) are to be specified on the site map.
- Evacuation route(s) and assembly area(s) will be designated by the ERC or designee before work begins.
- Personnel will assemble at the assembly area(s) upon hearing the emergency signal for evacuation.
- The ERC and a “buddy” will remain on the site after the site has been evacuated (if safe) to assist local responders and advise them of the nature and location of the incident.
- The ERC will account for all personnel in the onsite assembly area.
- A designated person will account for personnel at alternate assembly area(s).
- The ERC will follow the incident reporting procedures in the “Incident Notification, Reporting and Investigation” section of these Guidelines.

## 16.5 Evacuation Signals

Signal	Meaning
Grasping throat with hand	Emergency-help me.
Thumbs up	OK; understood.
Grasping buddy’s wrist	Leave area now.
Continuous sounding of horn	Emergency; leave site now.

## 16.6 Inclement Weather

Sudden inclement weather can rapidly encroach upon field personnel. Preparedness and caution are the best defenses. Field crew members performing work outdoors should carry clothing appropriate for inclement weather. Personnel are to take heed of the weather forecast for the day and pay attention for signs of changing weather that indicate an impending storm. Signs include towering thunderheads, darkening skies, or a sudden increase in wind. If stormy weather ensues, field personnel should discontinue work and seek shelter until the storm has passed.

Protective measures during a lightning storm include seeking shelter; avoiding projecting above the surrounding landscape (don't stand on a hilltop—seek low areas); staying away from open water, metal equipment, railroad tracks, wire fences, and metal pipes; and positioning people several yards apart. Some other general precautions include:

- Know where to go and how long it will take to get there. If possible, take refuge in a large building or vehicle. Do not go into a shed in an open area;
- The inclination to see trees as enormous umbrellas is the most frequent and most deadly mistake. Do not go under a large tree that is standing alone. Likewise, avoid poles, antennae, and towers;
- If the area is wide open, go to a valley or ravine, but be aware of flash flooding;
- If you are caught in a level open area during an electrical storm and you feel your hair stand on end, drop to your knees, bend forward and put your hands on your knees or crouch. The idea is to make yourself less vulnerable by being as low to the ground as possible and taking up as little ground space as possible. Lying down is dangerous, since the wet earth can conduct electricity. Do not touch the ground with your hands; and
- Do not use telephones during electrical storms, except in the case of emergency.

Remember that lightning may strike several miles from the parent cloud, so work should be stopped and restarted accordingly. The lightning safety recommendation is 30-30: Seek refuge when thunder sounds within 30 seconds after a lightning flash; and do not resume activity until 30 minutes after the last thunder clap.

High winds can cause unsafe conditions, and activities should be halted until wind dies down. High winds can also knock over trees, so walking through forested areas during high-wind situations should be avoided. If winds increase, seek shelter or evacuate the area. Proper body protection should be worn in case the winds hit suddenly, because body temperature can decrease rapidly.

### 16.6.1 Tornado Safety

Recognizing imminent tornado signs include seeing an unusually dark sky, possibly with some green or yellow clouds. You may hear a roaring or rumbling sound like a train, or a whistling sound like a jet. Large hail may also be falling. You may be able to see funnels, or they may be hidden by rain or hail.

Listen to your radio for tornado warnings during bad thunderstorms. If a tornado warning is issued, don't panic. Instead, listen and look. Quickly but calmly follow directions for getting to shelter.

Take cover. Indoors you should go down into the basement and crouch down under the stairs, away from windows. Do not take an elevator. If you can't get to a basement, go into a closet or bathroom and pull a mattress over you or sit underneath a sturdy piece of furniture on the ground floor near the center of the building. Pull your knees up under you and protect your head with your hands.

A bad place to be in a tornado is in a building with a large freestanding roof such as a gymnasium, arena, auditorium, church or shopping mall. If you are caught in such a building, take cover under something sturdy.

More than half of tornado deaths occur in mobile homes. If a tornado threatens, get out and go to a building with a good foundation, or lay down in a ditch away from vehicles and other objects.

If you are driving, get to a shelter, lie down in a ditch or seek cover up under the girders of an overpass or bridge. Stay as close to the ground as you can. Protect your head and duck flying debris.

Stay away from metal and electrical equipment because lightning accompanies tornadoes.

If you have time before the tornado strikes, secure objects such as garbage cans and lawn furniture which can injure people. While most tornado damage is a result of the violent winds, most injuries and deaths actually result from flying debris.

# Inspections

---

## 17.1 Management Health, Safety, Security, and Environment Inspections

The Management Inspection Checklist is intended to facilitate PM leadership, provide an opportunity for PM's to mentor field staff on HSE and identify any big picture actions that need to be addressed. Observations that would improve global HSE program should also be included on the form. This Checklist does NOT take the place of a formal HSE audit. The PM shall:

- Complete one checklist per month during field work when visiting the site. The PM may delegate completion to the task lead, field team leader, or construction manager if the project is short duration and a visit is not planned for.
- Complete applicable sections of the checklist (can be typed or hand-written). Address issues with the field team, taking the opportunity to mentor staff by identifying the "root cause" of observation (e.g., why are SBOs not being completed, had this hazard been noted by any other team members?).
- Send completed form to Project Delivery Manager, Sector HSE Lead, and RHSM for tracking and review. Original should be kept in the project files.

## 17.2 Project Activity Self-Assessment Checklists

In addition to the hazard controls specified in this document, Project Activity Self-Assessment Checklists are contained as an attachment to the project safety plan. The Project-Activity Self-Assessment Checklists are based upon minimum regulatory compliance and some site-specific requirements may be more stringent. The objective of the self-assessment process is to identify gaps in project safety performance, and prompt for corrective actions in addressing these gaps. The self-assessment checklists, including documented corrective actions, shall be made part of the permanent project records and maintained by the SC.

The self-assessment checklists will also be used by the SC in evaluating the subcontractors and any client contractors' compliance on site.

## 17.3 Safe Behavior Observations

Safe Behavior Observations (SBOs) are a tool to be used by supervisors to provide positive reinforcement for work practices performed correctly, while also identifying and eliminating deviations from safe work procedures that could result in a loss.

The SC or designee shall perform at least one SBO each week for any field work performed by subcontractors or when there are at least two CH2M HILL personnel performing field work.

The SC or designee shall complete the SBO form (attached to the project safety plan) for the task/operation being observed and submit them weekly.

For ES Federal Sector projects please email completed forms to: [CH2M HILL ES FED Safe Behavior Observation](#)

For ES Commercial Sector projects please email completed forms to: [CH2M HILL ES COM Safe Behavior Observation](#)

For CNR ES staff please email completed forms to: [cncressafe@ch2m.com](mailto:cncressafe@ch2m.com)

For International ES projects please e-mail completed forms to: [ESINTLSafeBehaviorObservation@ch2m.com](mailto:ESINTLSafeBehaviorObservation@ch2m.com)

## SECTION 18

# Incident Notification, Reporting, and Investigation

---

(Reference CH2M HILL SOP HSE-111, *Incident Notification, Reporting and Investigation*)

## 18.1 General Information

This section applies to the following:

- All injuries involving employees, third parties, or members of the public;
- Damage to property or equipment;
- Interruptions to work or public service (hitting a utility);
- Incidents which attract negative media coverage;
- Near misses;
- Spills, leaks, or regulatory violations; and
- Motor vehicle accidents.

Documentation, including incident reports, investigation, analysis and corrective measure taken, shall be kept by the SC and maintained onsite for the duration of the project.

## 18.2 Section Definitions

**Incident:** An incident is an event that causes or could have caused undesired consequences. An incident may be caused by natural forces, employees, subcontractors, or third parties in any location associated with CH2M HILL operations, including offices, warehouses, project sites, private property, or public spaces. Incidents include:

- Injury or illness to a CH2M HILL employee or subcontractor employee, or member of the public;
  - Property damage;
  - Spill or release;
  - Environmental requirement or permit violation;
  - A “near-miss”; or
  - Other (e.g., fire, explosion, bomb threat, workplace violence, threats)
- Accident:** an incident involving actual loss through injury, damage to assets, or environmental harm.

**Near Miss:** A near-miss occurs when an intervening factor prevented an injury or illness, property damage, spill or release, permit violation or other event from occurring. Examples of near-miss situations include: a hard hat or other personal protective equipment (PPE) prevented an injury; secondary containment or emergency shutoff prevented a spill; or an alert co-worker prevented an incident.

### Serious Incident

A Serious Incident must be immediately reported to senior management includes:

- Work related death, or life threatening injury or illness of a CH2M HILL employee;
- subcontractor, or member of the public;
- Kidnap/missing person;
- Acts or threats of terrorism;
- Event that involves a fire, explosion, or property damage that requires a site evacuation or is estimated to result in greater than \$ 500,000 in damage; or

- Spill or release of hazardous materials or substances that involves a significant threat of imminent harm to site workers, neighboring facilities, the community or the environment.

## 18.3 Reporting Requirements

All employees and subcontractors' employees shall immediately report any incident (including "near misses," as defined in the section above) in which they are involved or witness to their supervisor.

The CH2M HILL or Subcontractor supervisor, upon receiving an incident report, shall inform his immediate superior and the CH2M HILL SC.

The SC shall immediately report the following information to the RHSM and PM by phone and e-mail:

- Project Name and Site Manager;
- Date and time of incident;
- Description of incident;
- Extent of known injuries or damage;
- Level of medical attention; and
- Preliminary root cause/corrective actions

If the incident was an environmental permit issue (potential permit non-compliance, other situation that result in a notice of violation) or a spill or release, contact the Project EM immediately so evaluation of reportable quantity requirements and whether agency reporting is required.

The CH2M HILL team shall comply with all applicable statutory incident reporting requirements such as those to OSHA, the police, or state or Federal environmental agency.

Be aware that many OSHA-designated states require reporting to the area OSHA office if one person is admitted to the hospital (e.g., California and Washington); whereas Federal OSHA requires it if three or more are admitted.

## 18.4 Drug and Alcohol Testing for CH2M HILL Employees

As required by CH2M HILL Policy 810, U.S. Employees are subject to post-incident and reasonable suspicion drug and alcohol testing. The Employee must submit to drug and alcohol testing if the supervisor has a reasonable suspicion, and when any of the following occur:

- Work-related injury in which the Company reasonably believes (under the Reasonable Suspicion provisions in the Policy) that drug and/or alcohol use is a contributing factor;
- Incident resulting in property damage over USD\$500 as determined by the Company;
- Injury on or in Company Property/Workplace (to Employee or third parties) involving the Employee's use of heavy machinery as determined by the Company;
- Incident considered to be a serious near-miss injury that occurs in the field or in the office as determined by the Company and where the Company reasonably believes (under the Reasonable Suspicion provisions in the Policy) that drug and/or alcohol use is a contributing factor to the serious near miss injury;
- Other circumstances as dictated by Employee Relations; or
- An Employee contributes to any of the above.

Except in emergencies, the employee must remain available for testing. Failure to remain available will be considered as a refusal to submit to the testing, which will result in disciplinary action. Following the test, if there is no reasonable suspicion, the Employee returns to work. The employee will not be allowed to operate any company vehicle or company equipment, or work in any designated areas, pending the result of the drug and/or alcohol test.

Employees who are required to submit to reasonable suspicion testing are prohibited from transporting themselves to or from the collection site. The supervisor will arrange for transportation; the employee will be transported by a CH2M HILL staff member. The employee must remain under the direct observation of the supervisor until turned over to the transporter. The employee will not be allowed to eat or drink unless instructed by the collector as this may hinder or decrease the company's ability to obtain a valid sample once the drug and/or alcohol test is administered.

After returning from the collection site, the employee must make arrangements to be transported home or to his/her residence. Supervisors must contact local authorities if an employee insists on driving a vehicle. Pending receipt of the drug and alcohol test results, the employee may not return to work.

## 18.5 Drug and Alcohol Testing for Subcontractors

The drug and alcohol testing requirements stated above apply to subcontractors when required by the subcontract.

## 18.6 HITS System and Incident Report Form

CH2M HILL maintains a HITS entry and/or Incident Report Form (IRF) for all work-related injuries and illnesses sustained by its employees in accordance with recordkeeping and insurance requirements. A HITS entry and/or IRF will also be maintained for other incidents (property damage, fire or explosion, spill, release, potential violation, and near misses) as part of our loss prevention and risk reduction initiative.

The SC shall complete an entry into the Hours and Incident Tracking System (HITS) database system located on CH2M HILL's Virtual Office (or if VO not available, use the hard copy Incident Report Form and Root Cause Analysis Form and forward it to the RHSM) within 24 hours and finalize those forms within 3 calendar days.

## 18.7 Injury Management/Return-to-Work (for U.S./Puerto Rico based CH2M HILL Staff Only)

(Reference CH2M HILL, SOP HSSE-124, *Injury Management/Return-to-Work*)

### 18.7.1 Background

The Injury Management Program has been established to provide orderly, effective and timely medical treatment and return-to-work transition for an employee who sustains a work-related injury or illness. It also provides guidance and assistance with obtaining appropriate treatment to aid recovery, keep supervisors informed of employee status, and to quickly report and investigate work-related injury/illnesses to prevent recurrence.

To implement the Injury Management/Return-to-Work Program successfully, supervisors and/or SC should:

- Ensure employees are informed of the Injury Management/Return-to-Work Program;
- Become familiar with the Notification Process (detailed below); and
- Post the Injury Management/Return-to-Work Notification Poster.

### 18.7.2 The Injury Management/Return-to-Work Notification Process:

- Employee informs their supervisor.
- Employee calls the Injury Management Program toll free number 1-866-893-2514 immediately and speaks with the Occupational Injury Nurse. This number is operable 24 hours per day, 7 days a week. **Employees are encouraged to enter this phone number into their cell phones prior to starting field work.**
- Supervisor ensures employee immediately calls the Injury Management Program number. Supervisor makes the call with the injured worker or for the injured worker, if needed.
- Nurse assists employee with obtaining appropriate medical treatment, as necessary schedules clinic visit for employee (calls ahead, and assists with any necessary follow up treatment). The supervisor or SC



accompanies the employee if a clinic visit is necessary to ensure that employees receive appropriate and timely care.

- Supervisor or SC completes the HITS entry or Incident Report Form immediately (within 24 hours) and forwards it to the Project Manager and RHSM.
- Nurse notifies appropriate CH2M HILL staff by e-mail (supervisor, Health & Safety, Human Resources, Workers' Compensation).
- Nurse communicates and coordinates with and for employee on treatment through recovery.
- Supervisor ensures suitable duties are identified and available for injured or ill workers who are determined to be medically fit to return to work on transitional duty (temporary and progressive).
- Supervisor ensures medical limitations prescribed (if any) by physician are followed until the worker is released to full duty.

## 18.8 Serious Incident Reporting Requirements

(Reference CH2M HILL SOP HSE-111, *Incident Reporting, Notification and Investigation*)

The serious incident reporting requirements ensures timely notification and allows for positive control over flow of information so that the incident is handled effectively, efficiently, and in conjunction with appropriate corporate entities. This standard notification process integrates Health, Safety, Security and Environment and Firm Wide Security Operations requirements for the consistent reporting of and managing of serious events throughout our operations.

### 18.8.1 Serious Incident Determination

The following are general criteria for determining whether an incident on CH2M HILL owned or managed facilities or program sites is considered serious and must be immediately reported up to Group President level through the reporting/notification process:

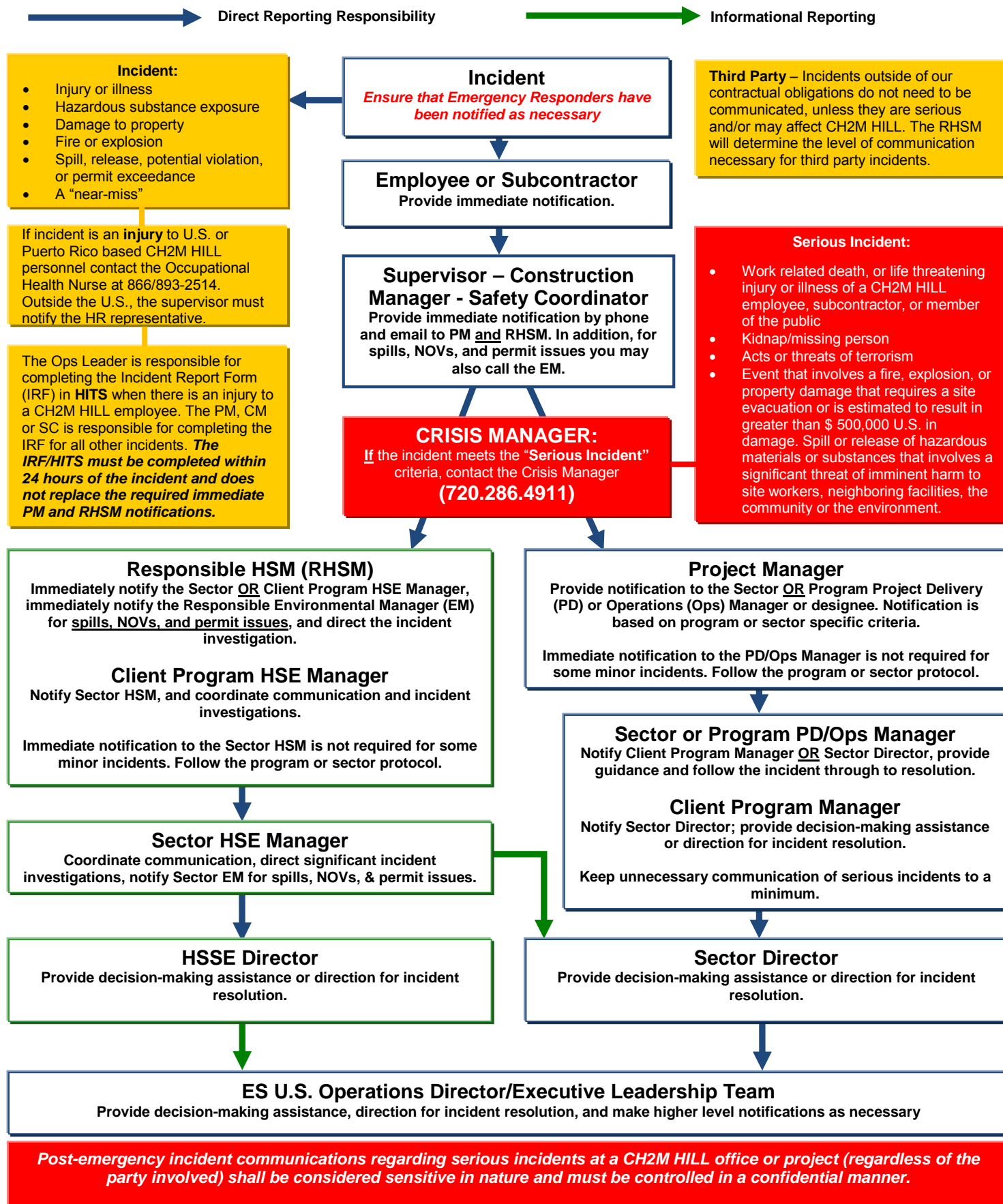
- Work related death, or life threatening injury or illness of a CH2M HILL employee, subcontractor, or member of the public;
- Kidnap or missing person;
- Acts or threats of terrorism;
- Event that involves a fire, explosion, or property damage that requires a site evacuation or is estimated to result in greater than \$ 500,000 in damage; or
- Spill or release of hazardous materials or substances that involves a significant threat of imminent harm to site workers, neighboring facilities, the community or the environment.

### 18.8.2 Serious Incident Reporting

If an incident meets the "Serious Incident" criteria, the Project Manager is to immediately contact the Crisis Manager at 720-286-4911, then follow the standard incident reporting procedure.

For all serious incidents this standard reporting process is implemented immediately so as to ultimately achieve notification to the Business Group President within 2 hours of incident onset or discovery, and notification to appropriate corporate Crisis Management Support Team.

# ESBG U.S. Operations Incident Reporting Flow Diagram



## 18.9 Incident Root Cause Analysis

The accident analysis is essential if all causes of the incident are to be identified for the correct remedial actions to be taken to prevent the same and similar type of incident from recurring. Root Cause Analysis (RCA) shall be completed for all recordable injuries, property damage incidents in excess of \$5,000.00 (U.S.), environmental permit violations, spills and releases which are required to be reported to regulatory agencies, and any other incident, including near misses where they RHSM or PM determines an RCA is appropriate. The RHSM/REM is responsible for ensuring it is completed and results entered in the incident report form in HITS. RCA's must be completed using a Team that includes, at least the RHSM or designee, the involved party(ies), a responsible operations representative (e.g., PM, construction manager, crew supervisor, etc.) and an independent management representative not associated with the incident.

The Root Cause Analysis Form must be completed for all Loss Incidents and Near Loss Incidents. This form must be submitted to the investigation team for review.

For minor losses or near losses, the information may be gathered by the supervisor or other personnel immediately following the loss. Based on the complexity of the situation, this information may be all that is necessary to enable the investigation team to analyze the loss, determine the root cause, and develop recommendations. More complex situations may require the investigation team to revisit the loss site or re-interview key witnesses to obtain answers to questions that may arise during the investigation process.

Photographs or videotapes of the scene and damaged equipment should be taken from all sides and from various distances. This point is especially important when the investigation team will not be able to review the loss scene.

The investigation team must follow the Root Cause Analysis Flow Chart (see Attachment 4 of the SOP) to assist in identifying the root cause(s) of a loss. Any loss may have one or more root causes and contributing factors. The root cause is the primary or immediate cause of the incident, while a contributing factor is a condition or event that contributes to the incident happening, but is not the primary cause of the incident. Root causes and contributing factors that relate to the person involved in the loss, his or her peers, or the supervisor should be referred to as "personal factors." Causes that pertain to the system within which the loss or injury occurred should be referred to as "job factors."

Personal factors include:

- Lack of skill or knowledge;
- Correct way takes more time and/or requires more effort;
- Short-cutting standard procedures is positively reinforced or tolerated; or
- Person thinks there is no personal benefit to always doing the job according to standards.

Job Factors include:

- Lack of or inadequate operational procedures or work standards;
- Inadequate communication of expectations regarding procedures or standards; or
- Inadequate tools or equipment.

The root cause(s) could be any one or a combination of these seven possibilities or some other uncontrollable factor. In the vast majority of losses, the root cause is very much related to one or more of these seven factors. Uncontrollable factors should be used rarely and only after a thorough review eliminates all seven other factors.

### 18.9.1 Corrective Actions

Include all corrective actions taken or those that should be taken to prevent recurrence of the incident. Include the specific actions to be taken, the employer and personnel responsible for implementing the actions, and a timeframe for completion. Be sure the corrective actions address the causes.

Once the investigation report has been completed, the PM shall hold a review meeting to discuss the incident and provide recommendations. The responsible supervisors shall be assigned to carry out the recommendations, and shall inform the SC upon successful implementation of all recommended actions.

- Evaluation and follow-up of the IRF will be completed by the type of incident by the RHSM, EM, or FWSO.
- Incident investigations must be initiated and completed as soon as possible but no later than 72 hours after the incident.

## SECTION 19

# Records and Reports

---

An organized project filing system is essential for good documentation and recordkeeping. There are many benefits to an organized filing system:

- Other CH2M HILL employees can easily and quickly find documents;
- Records are readily available for review;
- Records may be needed during OSHA investigations, audits, or other legal matters;
- Records may be needed on short notice in case of an accident, illness or other emergency; and
- Systematic recordkeeping aids in overall project organization.

The project filing system shall be established at the beginning of the project and maintained throughout all phases of construction and archived in accordance with CH2M HILL's Records Retention Policy. The information contained in the filing system shall be updated regularly and/or as specified in this document. The PM and SC are responsible for collecting documentation, including subcontractor documentation, and maintaining a complete and organized filing system.

Below are examples of records that must be maintained as the project progresses:

- Exposure records includes air monitoring data (including calibration records), SDSs, exposure modeling results;
- Physical hazard exposure records include noise, ionizing radiation, non-ionizing radiation, vibration, and lasers exposure assessments and measurements;
- Respiratory fit test records;
- Training records;
- Incident reports, investigations and associated back-up information such as agency notifications, calculations, and corrective actions taken;
- Federal or state agency inspection records;
- Other Records:
  - Ergonomic evaluations;
  - HSE audits and assessments;
  - Project-specific HSE plans;
  - Confined space entry permits;
  - Equipment inspections;
  - Equipment maintenance;
  - Emergency equipment inspection records;
  - SBOs;
  - Self-assessment checklists
- The RHSM shall coordinate with the PM or designee to ensure that final project-specific HSE records described in this section, including negative exposure determinations, are maintained with the project files in accordance with the CH2M HILL records retention schedule, or forwarded to the Medical Surveillance Program Administrator, as appropriate. Records retention requirements are detailed in the Recordkeeping and Access to Records SOP, HSE-119.

# CH2M HILL Employee Sign-Off

---

I hereby acknowledge that I have received, read, understand, and will comply with these Guidelines.

Name (printed): \_\_\_\_\_

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

Make a photo copy or scan and send this completed sign-off page to your CH2M HILL Safety Program Assistant (SPA).

## Subcontractor Sign-Off

## SUBCONTRACTOR SIGNOFF FORM

# ESBG HSSE GUIDELINES

The CH2M HILL project employees and subcontractors listed below have been provided with these Guidelines, have read and understood them, and agree to abide by its provisions.

This sign-off sheet shall be maintained with the project safety plan.

[illegible]

**Attachment B**  
**Project Forms/Templates**

---



Field Documentation, Readiness, and Implementation		Comments
<b>Health and Safety Plan(s)</b>		
<input type="checkbox"/>	CH2M HILL plan signed by HSM and PM	
<input type="checkbox"/>	CH2M HILL plan approved (within last year)	
<input type="checkbox"/>	Sub HSP, if applicable, accepted by HSM and on site	
<input type="checkbox"/>	All field workers signed both CH2M HILL and, if applicable, Sub plan	
<b>AHAs</b>		
<input type="checkbox"/>	All field tasks covered by AHA	
<input type="checkbox"/>	CH2M HILL AHAs present and approved by HSM	
<input type="checkbox"/>	Sub AHAs present and accepted by HSM	
<b>Training and Medical Certs</b>		<a href="#">Tracking form available</a>
<input type="checkbox"/>	CH certs verified current	
<input type="checkbox"/>	Sub certs verified current	
<input type="checkbox"/>	Specialized training certs verified (CSE, fall protection, forklift)	
<b>Safety Meeting/PTSP Documentation</b>		
<input type="checkbox"/>	<a href="#">Forms available</a>	
<b>HazCom-required paperwork</b>		
<input type="checkbox"/>	Inventory developed (HSP Attachment)	
<input type="checkbox"/>	SDSs available	
<input type="checkbox"/>	Training documented (HSP Attachment)	
<b>Project Self-Assessment Checklists</b>		
<input type="checkbox"/>	Checklists available per HSP	
<input type="checkbox"/>	Corrective actions to be taken tracked and closed out	
<b>SBOs</b>		
<input type="checkbox"/>	<a href="#">Forms available and frequency of completion known</a>	
<input type="checkbox"/>	SBO e-mail addresses known (see form, send once a week)	
<b>Incident/Injury reporting process/paperwork (HITS)</b>		
<input type="checkbox"/>	Notification and HITS entry process known and paperwork available	
<b>Air monitoring instrumentation and documentation</b>		
<input type="checkbox"/>	Correct equipment per HSP (correct PID lamp, if applicable) available	
<input type="checkbox"/>	Calibration gas, if applicable, ordered and onsite	
<input type="checkbox"/>	Action levels known	
<input type="checkbox"/>	<a href="#">Calibration documented prior to use</a>	
<input type="checkbox"/>	<a href="#">Breathing zone readings documented</a>	
<input type="checkbox"/>	Completed air monitoring documentation sent to SPA	
<b>Physiological monitoring paperwork</b>		
<input type="checkbox"/>	Action levels known	
<input type="checkbox"/>	WBGT, thermometer, or watch available	
<input type="checkbox"/>	Form available	
<b>Special permits (Hot Work, CSE, etc.)</b>		
<input type="checkbox"/>	Required forms and permits available	
<b>Specific/specialized plans and postings (Lone Worker, Critical Lift, asbestos)</b>		
<input type="checkbox"/>	Lone worker protocol established (if applicable)	
<input type="checkbox"/>	Lead or asbestos plans in place (if applicable)	
<input type="checkbox"/>	Critical lift plan necessary?	
<b>Emergency Planning</b>		
<input type="checkbox"/>	Emergency Contacts and route to hospital posted	

<input type="checkbox"/>	Emergency plan rehearsed (table top at minimum)	
<b>Equipment Inspections</b>		
<input type="checkbox"/>	Equipment inspected as brought on site	
<input type="checkbox"/>	Regular heavy equipment inspections documented	
<b>Personal Protective Equipment</b>		
<input type="checkbox"/>	PPE verified per HSP/AHAs and on site	
<b>Environmental Considerations</b>		
<input type="checkbox"/>	Waste drums on-site	
<input type="checkbox"/>	Erosion control devices on site	
<input type="checkbox"/>	Labels available and crew knows how to fill out?	
<b>Decon</b>		
<input type="checkbox"/>	Any special equipment needed? (Tubs, brushes, waste drums?)	

<b>SC REMINDERS</b>		
<b>DAILY</b>		
<input type="checkbox"/>	PTSP, Daily Safety Meeting, review observations from previous day's work with CH team/subs	
<input type="checkbox"/>	Informal site inspections (documented in logbook along with any corrective actions taken)	
<input type="checkbox"/>	Air monitoring calibration documented on daily site monitoring form or in logbook	
<input type="checkbox"/>	Air monitoring readings documented on daily site monitoring (or equivalent) form and kept in project files	
<input type="checkbox"/>	Heat stress monitoring conducted if specified in plan	
<input type="checkbox"/>	Incident reporting/assist with investigations	
<input type="checkbox"/>	Filling out field logbook	
<input type="checkbox"/>	Ensure SDSs for new chemicals brought onsite are inventoried and added to SDS book, training is given to CH personnel or subs are giving training to their workers	
<input type="checkbox"/>	Briefing on CH2M HILL HSP for any new personnel coming onsite, including subcontractor personnel and verifying training	
<input type="checkbox"/>	Project file maintenance for H&S documentation	
<b>WEEKLY</b>		
<input type="checkbox"/>	Safe Behavior Observations – send to SBO mailbox (more frequently if indicated in safety plan)	
<input type="checkbox"/>	Complete self-assessment checklists (applicable to type of work going on and as specified in safety plan)	
<b>MONTHLY</b>		
<input type="checkbox"/>	Fire extinguisher inspections (document on fire extinguisher tags)	
<input type="checkbox"/>	First aid kit/eyewash inspections (documented—for eyewash on tag—first aid kit in logbook)	
<b>MANDATORY POSTINGS</b>		
<input type="checkbox"/>	State and Federal required postings including minimum wage, OSHA "It's the Law," fair employment, worker's compensation, etc. (Vendor for all-in-one poster is <i>Compliance Poster Company</i> 1-800-817-7678)	
<input type="checkbox"/>	Evacuation routes and rally points	
<input type="checkbox"/>	Tornado shelter (as applicable)	
<input type="checkbox"/>	OSHA 300 log (February thru April of every year)	
<input type="checkbox"/>	Emergency phone numbers	
<input type="checkbox"/>	Route to Hospital map and phone number	
<input type="checkbox"/>	<a href="#">Others -- CH2M HILL VO Enterprise HSE Page - Posters</a>	

# CH2MHILL

## Pre-Task Safety Plan (PTSP) and Safety Meeting Sign-in Sheet

Project: _____ Location: _____ Date: _____		
Supervisor: _____ Job Activity: _____ _____		
Attendees:	Print Name	Sign Name
_____ _____ _____ _____ _____ _____ _____		
List Tasks and verify that applicable AHAs have been reviewed: _____ _____ _____		
Tools/Equipment Required for Tasks (ladders, scaffolds, fall protection, cranes/rigging, heavy equipment, power tools): _____ _____ _____		
Potential H&S Hazards, including chemical, physical, safety, biological and environmental (check all that apply):		
__ Chemical burns/contact	__ Trench, excavations, cave-ins	__ Ergonomics
__ Pressurized lines/equipment	__ Overexertion	__ Chemical splash
__ Thermal burns	__ Pinch points	__ Poisonous plants/insects
__ Electrical	__ Cuts/abrasions	__ Eye hazards/flying projectile
__ Weather conditions	__ Spills	__ Inhalation hazard
__ Heights/fall > 6 feet	__ Overhead Electrical hazards	__ Heat/cold stress
__ Noise	__ Elevated loads	__ Water/drowning hazard
__ Explosion/fire	__ Slips, trip and falls	__ Heavy equipment
__ Radiation	__ Manual lifting	__ Aerial lifts/platforms
__ Confined space entry	__ Welding/cutting	__ Demolition
__ Underground Utilities	__ Security	__ Poor communications
Other Potential Hazards (Describe): _____ _____ _____		

Hazard Control Measures (Check All That Apply):			
<b>PPE</b> <input type="checkbox"/> Thermal/lined <input type="checkbox"/> Eye <input type="checkbox"/> Dermal/hand <input type="checkbox"/> Hearing <input type="checkbox"/> Respiratory <input type="checkbox"/> Reflective vests <input type="checkbox"/> Flotation device <input type="checkbox"/> Hard Hat	<b>Protective Systems</b> <input type="checkbox"/> Sloping <input type="checkbox"/> Shoring <input type="checkbox"/> Trench box <input type="checkbox"/> Barricades <input type="checkbox"/> Competent person <input type="checkbox"/> Locate buried utilities <input type="checkbox"/> Daily inspections <input type="checkbox"/> Entry Permits/notification	<b>Fire Protection</b> <input type="checkbox"/> Fire extinguishers <input type="checkbox"/> Fire watch <input type="checkbox"/> Non-spark tools <input type="checkbox"/> Grounding/bonding <input type="checkbox"/> Intrinsically safe equipment	<b>Electrical</b> <input type="checkbox"/> Lockout/tagout <input type="checkbox"/> Grounded <input type="checkbox"/> Panels covered <input type="checkbox"/> GFCI/extension cords <input type="checkbox"/> Power tools/cord inspected <input type="checkbox"/> Overhead line clearance <input type="checkbox"/> Underground utils ID'd
<b>Fall Protection</b> <input type="checkbox"/> Harness/lanyards <input type="checkbox"/> Adequate anchorage <input type="checkbox"/> Guardrail system <input type="checkbox"/> Covered opening <input type="checkbox"/> Fixed barricades <input type="checkbox"/> Warning system	<b>Air Monitoring</b> <input type="checkbox"/> PID/FID <input type="checkbox"/> Detector tubes <input type="checkbox"/> Radiation <input type="checkbox"/> Personnel sampling <input type="checkbox"/> LEL/O2 <input type="checkbox"/> No visible dust <input type="checkbox"/> Other	<b>Proper Equipment</b> <input type="checkbox"/> Aerial lift/ladders/scaffolds <input type="checkbox"/> Forklift/heavy equipment <input type="checkbox"/> Backup alarms <input type="checkbox"/> Hand/power tools <input type="checkbox"/> Crane with current inspection <input type="checkbox"/> Proper rigging <input type="checkbox"/> Operator qualified	<b>Welding &amp; Cutting</b> <input type="checkbox"/> Cylinders secured/capped <input type="checkbox"/> Cylinders separated/upright <input type="checkbox"/> Flash-back arrestors <input type="checkbox"/> No cylinders in CSE <input type="checkbox"/> Flame retardant clothing <input type="checkbox"/> Appropriate goggles
<b>Confined Space Entry</b> <input type="checkbox"/> Isolation <input type="checkbox"/> Air monitoring <input type="checkbox"/> Trained personnel <input type="checkbox"/> Permit completed <input type="checkbox"/> Rescue	<b>Medical/ER</b> <input type="checkbox"/> First-aid kit <input type="checkbox"/> Eye wash <input type="checkbox"/> FA-CPR trained personnel <input type="checkbox"/> Route to hospital	<b>Heat/Cold Stress</b> <input type="checkbox"/> Work/rest regime <input type="checkbox"/> Rest area <input type="checkbox"/> Liquids available <input type="checkbox"/> Monitoring <input type="checkbox"/> Training	<b>Vehicle/Traffic</b> <input type="checkbox"/> Traffic control <input type="checkbox"/> Barricades <input type="checkbox"/> Flags <input type="checkbox"/> Signs
<b>Permits</b> <input type="checkbox"/> Hot work <input type="checkbox"/> Confined space <input type="checkbox"/> Lockout/tagout <input type="checkbox"/> Excavation <input type="checkbox"/> Demolition <input type="checkbox"/> Energized work	<b>Demolition</b> <input type="checkbox"/> Pre-demolition survey <input type="checkbox"/> Structure condition <input type="checkbox"/> Isolate area/utilities <input type="checkbox"/> Competent person <input type="checkbox"/> Hazmat present	<b>Inspections:</b> <input type="checkbox"/> Scaffolds <input type="checkbox"/> Heavy equipment <input type="checkbox"/> Drill rigs/geoprobe rigs <input type="checkbox"/> Cranes and rigging <input type="checkbox"/> Utilities marked	<b>Training:</b> <input type="checkbox"/> Hazwaste (current) <input type="checkbox"/> Construction <input type="checkbox"/> Task-specific <input type="checkbox"/> FA/CPR <input type="checkbox"/> Confined Space <input type="checkbox"/> Hazcom
<b>Underground Utilities</b> <input type="checkbox"/> Dig alert called <input type="checkbox"/> 3rd Party locator <input type="checkbox"/> As-builts reviewed <input type="checkbox"/> Interview site staff <input type="checkbox"/> Client review <input type="checkbox"/> soft locate necessary?	<b>Incident Communications</b> <input type="checkbox"/> Work stops until cleared by TM/CM <input type="checkbox"/> Immediate calls to TM/CM <input type="checkbox"/> Client notification <input type="checkbox"/> 24 hour notification setup <input type="checkbox"/> Clear communications	<b>AHA's</b> <input type="checkbox"/> reviewed and approved by HSM <input type="checkbox"/> on site and current <input type="checkbox"/> applicable for this day's work <input type="checkbox"/> Communication and incident processes included?	
<b>Field Notes (including observations from prior day, etc.):</b> <hr/> <hr/> <hr/>			

Name (Print): \_\_\_\_\_

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

## CHEMICAL INVENTORY/REGISTER FORM

Refer to Standard of Practice HSE-107 Attachment 1 for instructions on completing this form.

Location: _____			
HCC: _____			
<input type="checkbox"/> Office	<input type="checkbox"/> Warehouse	<input type="checkbox"/> Laboratory	<input type="checkbox"/> Project: _____
			Project No.: _____

Regulated Product	Location	Container labeled (✓if yes)	MSDS available (✓if yes)

MSDS for the listed products will be maintained at: _____
---

**CHEMICAL-SPECIFIC TRAINING FORM**

Refer to Standard Operating Procedure HSE-107 Attachment 1 for instructions on completing this form.

Location: _____	Project No. (if appropriate): _____
HCC: _____	Trainer: _____

**TRAINING PARTICIPANTS:**

Name	Signature	Name	Signature

**REGULATED PRODUCTS AND/OR TASKS COVERED BY THIS TRAINING:**


The HCC shall use the product MSDS to provide the following information concerning each of the products listed above:

- ☐ Physical and health hazards
- ☐ Control measures that can be used to provide protection (including appropriate work practices, emergency procedures, and personal protective equipment to be used)
- ☐ Methods and observations used to detect the presence or release of the regulated product in the workplace (including periodic monitoring, continuous monitoring devices, and visual appearance or odor of regulated product when being released)

Training participants shall have the opportunity to ask questions concerning these products and upon completion of this training will understand the product hazards and appropriate control measures available for their protection.

Copies of MSDSs, chemical inventories, and CH2M HILL's written hazard communication program shall be made available for employee review in the facility/project hazard communication file.

Safe Behavior Observation Form			
<input type="checkbox"/> Federal <input type="checkbox"/> Commercial   (check one)		<input type="checkbox"/> Construction or <input type="checkbox"/> Consulting (check one)	
Project Number:		Client/Program:	
Project Name:		Observer:	Date:
Position/Title of worker observed:		Background Information/ comments:	
Task/Observation Observed: _____			
❖ Identify and reinforce safe work practices/behaviors ❖ Identify and improve on at-risk practices/acts ❖ Identify and improve on practices, conditions, controls, and compliance that eliminate or reduce hazards ❖ Proactive PM support facilitates eliminating/reducing hazards (do you have what you need?) ❖ Positive, corrective, cooperative, collaborative feedback/recommendations			
Actions & Behaviors	Safe	At-Risk	Observations/Comments
Current & accurate Pre-Task Planning/Briefing (Project safety plan, STAC, AHA, PTSP, tailgate briefing, etc., as needed)			<b>Positive Observations/Safe Work Practices:</b>
Properly trained/qualified/experienced			
Tools/equipment available and adequate			
Proper use of tools			<b>Questionable Activity/Unsafe Condition Observed:</b>
Barricades/work zone control			
Housekeeping			
Communication			
Work Approach/Habits			
Attitude			
Focus/attentiveness			<b>Observer's Corrective Actions/Comments:</b>
Pace			
Uncomfortable/unsafe position			
Inconvenient/unsafe location			
Position/Line of fire			
Apparel (hair, loose clothing, jewelry)			
Repetitive motion			<b>Observed Worker's Corrective Actions/Comments:</b>
Other...			

For ES Federal Sector projects please email completed forms to: [CH2MHILLSESFEDSafeBehaviorObservation@ch2m.com](mailto:CH2MHILLSESFEDSafeBehaviorObservation@ch2m.com)

For ES Commercial Sector projects please email completed forms to: [SafeBehaviorObservations@ch2m.com](mailto:SafeBehaviorObservations@ch2m.com)

For CNR ES staff please email completed forms to: [cnressafe@ch2m.com](mailto:cnressafe@ch2m.com)

For International ES projects please e-mail completed forms to: [ESINTLSafeBehaviorObservation@ch2m.com](mailto:ESINTLSafeBehaviorObservation@ch2m.com)

## HEAT STRESS PHYSIOLOGICAL MONITORING FORM

Project:

Date:

Company:

1. Take and record measurement of temperature or pulse at the frequency indicated in the safety plan.
2. Follow the Physiological Monitoring Protocol in the safety plan.
3. Never continue work if your body temperature is more than 100.4° F/38° C, or if you are experiencing sudden and severe fatigue, nausea, dizziness, or lightheadedness.

Employee:

Describe action taken below if measurements are exceeded:

Time								
Temp								
Heat Index								
Pulse								

Employee:

Describe action taken below if measurements are exceeded:

Time								
Temp								
Heat Index								
Pulse								

Employee:

Describe action taken below if measurements are exceeded:

Time								
Temp								
Heat Index								
Pulse								

Employee:

Describe action taken below if measurements are exceeded:

Time								
Temp								
Heat Index								
Pulse								



Date Prepared:	Task Risk Assessment Code (RAC):	L, M, H, or E																																				
Job/Activity:																																						
Project:		Probability																																				
Prepared by:																																						
Reviewed by (PM/Site Supervisor/H&S):																																						
Description of the work:	<div>E = Extremely High Risk H = High Risk M = Moderate Risk</div> <table><thead><tr><th></th><th></th><th>Frequent</th><th>Likely</th><th>Occasional</th><th>Seldom</th><th>Unlikely</th></tr></thead><tbody><tr><td rowspan="4">Severity</td><td>Catastrophic</td><td>E</td><td>E</td><td>H</td><td>H</td><td>M</td></tr><tr><td>Critical</td><td>E</td><td>H</td><td>H</td><td>M</td><td>L</td></tr><tr><td>Marginal</td><td>H</td><td>M</td><td>M</td><td>L</td><td>L</td></tr><tr><td>Negligible</td><td>M</td><td>L</td><td>L</td><td>L</td><td>L</td></tr></tbody></table>								Frequent	Likely	Occasional	Seldom	Unlikely	Severity	Catastrophic	E	E	H	H	M	Critical	E	H	H	M	L	Marginal	H	M	M	L	L	Negligible	M	L	L	L	L
		Frequent	Likely	Occasional	Seldom	Unlikely																																
Severity	Catastrophic	E	E	H	H	M																																
	Critical	E	H	H	M	L																																
	Marginal	H	M	M	L	L																																
	Negligible	M	L	L	L	L																																

Work Activity Sequence (Identify the principal steps involved and the sequence of work activities)	Potential Health and Safety Hazards (Analyze each principal step for potential hazards)	Hazard Controls (Develop specific controls for each potential hazard)
		<div></div>
		<div></div>
		<div></div>
		<div></div>
		<div></div>



PRINT NAME

SIGNATURE

Supervisor Name: \_\_\_\_\_

Date/Time:\_\_\_\_\_

Safety Officer Name:\_\_\_\_\_

Date/Time:\_\_\_\_\_

Employee Name(s): \_\_\_\_\_

Date/Time:\_\_\_\_\_

\_\_\_\_\_

Date/Time:\_\_\_\_\_

\_\_\_\_\_

Date/Time:\_\_\_\_\_

\_\_\_\_\_

Date/Time:\_\_\_\_\_

\_\_\_\_\_

Date/Time:\_\_\_\_\_

\_\_\_\_\_

Date/Time:\_\_\_\_\_

\_\_\_\_\_

Date/Time:\_\_\_\_\_

\_\_\_\_\_

Date/Time:\_\_\_\_\_

\_\_\_\_\_

Date/Time:\_\_\_\_\_

**DAILY SITE MONITORING REPORT**

Page 1 of \_\_\_\_

Project:	Date:
Task Name:	Subcontractor(s):
Description of Activities:	Description of Potential Contaminant(s) and Source:

**Monitoring Instrumentation**

Instrumentation Description:	Calibration gas and lot number:
Instrument ID Number:	Time & Date Calibrated:
	Calibration Results:

**Site Monitoring Results**

Time(s)	Monitoring Location (note distance from source, upwind/downwind, etc.)	Sample Type (source, breathing zone, area, etc.)	Instrument Reading (Units)	Comments or list name and company of person if reading is a Breathing Zone sample,*

**Review**

Sampler:	Signature:	Date:
----------	------------	-------

\*IF RESULTS ARE BREATHING ZONE RESULTS, SEND THIS COMPLETED FORM TO YOUR HEALTH AND SAFETY MANAGER.

# DAILY SITE MONITORING REPORT

Page \_\_\_\_ of \_\_\_\_

## Site Monitoring Results

[illegible]

## Review

Sampler:

Signature:

Date:

## HITS Incident Report Hardcopy (Phase 1 – Initial Entry)

### Phase 1 – Initial Entry

#### Type of Incident (May select more than one)

- |  |   |                                    |
|--|---|------------------------------------|
| <input type="checkbox"/> Injury/Illness  | <input type="checkbox"/> Spill/Release      | <input type="checkbox"/> Near Miss |
| <input type="checkbox"/> Property Damage | <input type="checkbox"/> Environment/Permit | <input type="checkbox"/> Other     |

#### General Information Section

Preparer's Name: \_\_\_\_\_ Preparer's Phone Number: \_\_\_\_\_

Date of Incident: \_\_\_\_\_ Time of Incident: \_\_\_\_\_ AM / PM

What Business Group is accountable for this incident: \_\_\_\_\_

What Business Group SubGroup is accountable for this incident: \_\_\_\_\_

What CH2M HILL Company is accountable for this incident: \_\_\_\_\_

#### Where did the Incident occur?

- ☐ United States, Geographic Region: \_\_\_\_\_
- ☐ Canada, Province/Territory: \_\_\_\_\_
- ☐ International, County: \_\_\_\_\_

#### Location of Incident?

- ☐ Company Premises, CH2M HILL Office (use 3 letter office code if available): \_\_\_\_\_
- ☐ Project, Project name: \_\_\_\_\_
- ☐ In Transit
- Traveling from: \_\_\_\_\_
- Traveling to: \_\_\_\_\_
- ☐ At Home
- ☐ Other, Specify: \_\_\_\_\_

Describe the incident: \_\_\_\_\_

Describe how this event could have been prevented: \_\_\_\_\_

#### Provide Witness Information:

Name: _____	Phone: _____
Name: _____	Phone: _____
Name: _____	Phone: _____

#### Personnel Notified of Incident (Provide name, date and time):

CH2M HILL Personnel: \_\_\_\_\_

Client Personnel: \_\_\_\_\_

#### Additional Comments:

#### Injury/Illness Section [Complete only if Injury/Illness Incident type selected]

##### Who was injured?

- ☐ CH2M HILL Employee or CH2M HILL Temp Employee
- ☐ Subcontractor to CH2M HILL (Non-LLC Joint Venture Project)
- ☐ LLC Joint Venture Partner Employee
- ☐ LLC Joint Venture Project Subcontractor/Contractor
- ☐ Other

Name of Injured: \_\_\_\_\_ Job Title: \_\_\_\_\_

Employer Name: \_\_\_\_\_ Supervisor of Employee: \_\_\_\_\_

#### Complete for CH2M HILL Employee Injuries

Business Group of Injured Employee: \_\_\_\_\_

Has the employee called the Injury Management Administrator (1-866-893-2514)?

☐ Yes ☐ No ☐ Not Sure

Has the injured employee's supervisor been notified of this incident?

☐ Yes ☐ No ☐ Not Sure

**Complete for Non-CH2M HILL Employee Injuries**

Has the project safety coordinator been notified of this incident?

☐ Yes ☐ No ☐ Not Sure

Project Safety Coordinator: \_\_\_\_\_

Body Part Affected: \_\_\_\_\_

Injury/Illness (Result): \_\_\_\_\_

Describe treatment provided (if medication provided, identify whether over-the-counter or prescription): \_\_\_\_\_

Describe any work restriction prescribed (include dates and number of days): \_\_\_\_\_

**Physician/Health Care Provider Information**

Name: \_\_\_\_\_ Phone: \_\_\_\_\_

Was treatment provided away from the worksite?

☐ No  
☐ Yes

Facility Name: \_\_\_\_\_

Address: \_\_\_\_\_

City: \_\_\_\_\_ Phone Number: \_\_\_\_\_

Was injured treated in an emergency room?

☐ No ☐ Yes

Was injured hospitalized overnight as an in-patient?

☐ No ☐ Yes

**General Information Environmental Section [Complete only if Environment/Permit or Spill/Release Incident type selected]**

Who had control of the area during the incident?

- ☐ CH2M HILL, Company: \_\_\_\_\_  
☐ Subcontractor, Company: \_\_\_\_\_  
☐ Joint Venture Partner/Contractor/Subcontractor, Company: \_\_\_\_\_  
☐ Other, Company: \_\_\_\_\_  
Relationship to CH2M HILL: \_\_\_\_\_

**Property Damage Section [Complete only if Property Damage Incident type selected]**

Property Damaged: \_\_\_\_\_

Property Owner: \_\_\_\_\_

Damage Description: \_\_\_\_\_

Estimated US Dollar Amount: \_\_\_\_\_

**Spill or Release Section [Complete only if Spill/Release Incident type selected]**

Substance: \_\_\_\_\_

Estimated Quantity: \_\_\_\_\_

Did the spill/release move off the property?: \_\_\_\_\_

Spill/Release From: \_\_\_\_\_

Spill/Release To: \_\_\_\_\_

**Environment/Permit Section [Complete only if Environment/Permit Incident type selected]**

Describe Environmental or Permit Issue: \_\_\_\_\_

Permit Type: \_\_\_\_\_

Permitted Level or Criteria (e.g., discharge limit): \_\_\_\_\_

Permit Name and Number (e.g., NPDES No. ST1234): \_\_\_\_\_

Substance and Estimated Quantity: \_\_\_\_\_

Duration of Permit Exceedence: \_\_\_\_\_



# Lessons Learned

[Date] ESBG LL-13-xx

<b>Subject</b>	[Insert Descriptive Name of Lessons Learned]
<b>CH2M HILL Project?</b>	[Yes or No]
<b>Situation</b>	[Describe incident or situation that occurred in general terms. Try to be brief and avoid unnecessary details such as names of people or projects, business groups, divisions, dates, location, etc.]
<b>Lessons Learned (Recommendations and Comments)</b>	<ul style="list-style-type: none"><li>Bullet out any lessons learned, recommendations or other important “take away” information that would benefit others. Tie the recommendations to the incident or event, and avoid including information that is not directly tied to the event.</li></ul>
<b>Submitted By</b>	[Name/Office Location/Phone]
<b>Additional Information Contact</b>	[Name/Office Location/Phone]
<b>Keywords/Categories</b>	[Insert any keywords or incident categories that would aid in a search for this lessons learned]

Send completed Lessons Learned to the ESBG HSSE Director (Andy Strickland) for posting and distribution. Please include a recommended distribution list.



# OBSERVED HAZARD FORM

NAME/COMPANY OF OBSERVER (OPTIONAL):

\_\_\_\_\_

DATE REPORTED: \_\_\_\_\_

TIME REPORTED: \_\_\_\_\_

CONTRACTOR/S PERFORMING UNSAFE ACT OR CREATING UNSAFE CONDITION:

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

UNSAFE ACT OR CONDITION:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

LOCATION OF UNSAFE ACT OR CONDITION:

NAME OF CH2M HILL REPRESENTATIVE:

\_\_\_\_\_

CORRECTIVE ACTIONS TAKEN:

DATE: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

PROJECT SAFETY COMMITTEE EVALUATION:

DATE: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

# Stop Work Order

A work stoppage is issued for nonperformance issue(s) specified below and shall remain in effect until all corrective actions are completed.

Report prepared by:

Name:	Title:	Signature:	Date:

Issue of nonperformance

Description: _____ _____ _____ _____ _____ _____	Date of Nonperformance:  _____
---	--------------------------------------

Subcontractor signature of notification:

Name:	Title:	Signature:	Date:

*\* Corrective action is to be taken immediately. Note below the action taken, sign and return to CH2M HILL.\**

Subcontractor's Corrective Action

Description: _____ _____ _____ _____ _____ _____	Date of Corrective Actions:  _____
---	--

Subcontractor signature of correction:

Name:	Title:	Signature:	Date:

**CH2MHILL****Health and Safety Field Change Request (FCR)****Date of Change:****FCR No. (assigned by RHSM):****Applicable Health and Safety Plan Title:****Project Number:****Project Name & Location:****Subject of Change:****Recommended Change:****Reason for Change:****Submitted by:****Company:** CH2M HILL**Date:****Review & Acceptance:****Project Manager:****Date:****Health & Safety Mgr:****Date:****Distribution:**

1.

2.

3.

4.

5.

6.

7.

8.

File Copies: Project File

## Project Health and Safety Field Change Request Log

INSERT PROJECT NAME

[illegible]

Working Alone

CALL - IN CONTACT FORM

Date of site work:\_\_\_\_\_ Expected start time:\_\_\_\_\_

Name of CH2M HILL employee in the field:\_\_\_\_\_

Name of CH2M HILL employee responsible to receive contact: \_\_\_\_\_

Client Emergency Contact (if any): \_\_\_\_\_

CH2M HILL employee's contact numbers:

Radio #\_\_\_\_\_

Cell Phone #\_\_\_\_\_

Address and Location of work:\_\_\_\_\_

Directions/Map:

Planned Activity:\_\_\_\_\_

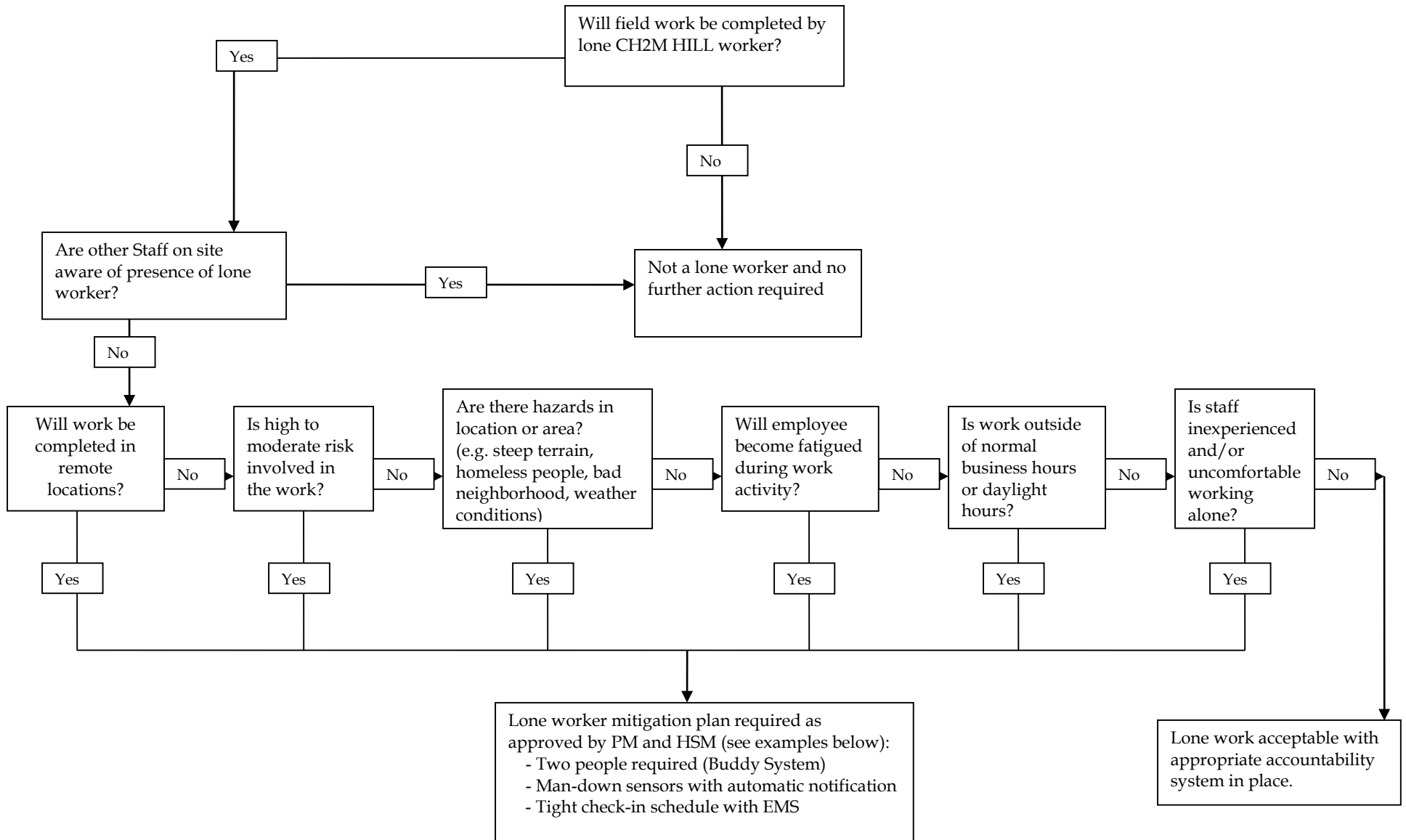
Specified Frequency and time for call in:\_\_\_\_\_

Time	Verified	Location





If lone worker fails to call in at specified frequency/ time:

- 1) Call worker's radio and cell to determine if an emergency exists.
- 2) If no reply, immediately call Client security/emergency service if there is one at the site.
- 3) If there is no client security call Emergency Services (911). Inform the dispatcher there is a lone worker that cannot be contacted and there may be an emergency on site. Provide the lone worker's name, their last known location, and your contact information.
- 4) After Emergency Services have been contacted, call the other emergency contacts, Project Manager, and Health and Safety Manager.

## Working Alone Determination Flowchart



**Form Instructions :** This form is to be used when employees expect to lift an object weighing more than 40 pounds (18 kilograms). To evaluate a lift please complete the first four steps and input your evaluation factors in Step 5. Based upon the evaluation factors, calculate the overall Lifting Evaluation Factor. Then determine the lift Risk Level and Evaluation Actions (Step 6).

Step 1: Load Weight Factor	<b>Actual Load Weight</b>	<b>Load Weight Factor</b>	Step 3: Posture Factors	<b>Posture and Position of Lift</b>	<b>Posture Factor</b>	
	< 10 pounds (4.5 kg.)	1		 Upper body upright, not twisted Load close to body Standing or walking a few steps Slight inclination forward or twisting of upper body	1	
	11 to 20 pounds (5 to 9 kg.)	2		 Slight inclination forward or twisting of upper body Load close to body Standing or walking longer distances	2	
	21 to 35 pounds (9.5 to 15 kg.)	4		 Low bending or extensive inclination forward Slight inclination forward with simultaneous twisting of upper body Load away from body or above shoulder height	4	
	36 to 50 pounds (16 to 22.5 kg.)	7		 Sitting Extensive inclination forward with simultaneous twisting of upper body Load away from body Restricted stability of posture when standing, squatting, or kneeling	8	
>50 pounds (22.5 kg.)	10					
Step 2: Duration/Frequency Factor	<b>Lifting Conditions</b>	<b>Lifting Condition Factor</b>				
	Good ergonomic conditions: Adequate space Level and solid floor or ground Adequate lighting Good gripping conditions Stable load	0				
	Undesirable ergonomic conditions: Restricted movement Restricted area height (less than 5 feet or 1.5 meters) Floor uneven, soft, slippery, or sloping Uneven weight distribution	1				
Step 4: Duration/Frequency	<b>Lifts per Minute</b>	<b>Hours per Day</b>			The number of lifts performed per minute and the duration of the lifts will determine the Duration/Frequency Factor	
		<1 hr.	1 to 2 hours	> 2 hours		
	< 1 lift per min.	1	2	4		
	1 lift every min.	2	2	4		
	2-3 lifts per min.	2	4	6		
	4-5 lifts per min.	4	4	6		
	6-7 lifts per min.	4	6	8		
8-9 lifts per min.	6	8	8			
> 9 lifts per min.	8	8	8			

Step 5: Lifting Evaluation	<b>Load Weight Factor</b>	+	<b>Lifting Condition Factor</b>	+	<b>Posture Factor</b>	X	<b>Duration/Frequency Factor</b>	=	<b>Lifting Evaluation Factor</b>

Step 6: Risk Level and Evaluation Actions	<b>Lifting Risk Factor</b>	<b>Risk Level and Evaluation Actions</b>
	<10	<b>Low Risk</b> - No action needed at this time
	10 to 25	<b>Elevated Risk</b> - Reduce Lifting Evaluation Factor by addressing the concerns of the Posture and Conditions Factors
	26 to 50	<b>Increased Risk</b> - Reduce Lifting Evaluation Factor by reducing Load Weight Factor and/or the Frequency/Duration of the lifts. Mechanical lifting devices may be used or assistance from other workers.
	>50	<b>High Risk</b> - Reduce Lifting Evaluation Factor by reducing each of the contributing factors. If Lifting Evaluation Factor cannot be reduced, then mechanical lifting devices or assistance from other workers is necessary.

## Attachment C Fact Sheets

---



## Tick-Borne Pathogens — A Fact Sheet

Most of us have heard of Lyme disease or Rocky Mountain Spotted Fever (RMSF), but there are actually six notifiable tick-borne pathogens that present a significant field hazard. In some areas, these account for more than half of our serious field incidents. The following procedures should be applied during any field activity—even in places that are predominantly paved with bordering vegetation.

### Hazard Recognition

An important step in controlling tick related hazards is understanding how to identify ticks, their habitats, their geographical locations, and signs and symptoms of tick-borne illnesses.

### Tick Identification

There are five varieties of hard-bodied ticks that have been associated with tick-borne pathogens. These include:

- Deer (Black Legged) Tick (eastern and pacific varieties)
- Lone Star Tick
- Dog Tick
- Rocky Mountain Wood Tick

These varieties and their geographical locations are illustrated on the following page.

### Tick Habitat

In eastern states, ticks are associated with deciduous forest and habitat containing leaf litter. Leaf litter provides a moist cover from wind, snow, and other elements. In the north-central states, is generally found in heavily wooded areas often surrounded by broad tracts of land cleared for agriculture.

On the Pacific Coast, the bacteria are transmitted to humans by the western black-legged (deer) tick and habitats are more diverse. For this region, ticks have been found in habitats with forest, north coastal scrub, high brush, and open grasslands. Coastal tick populations thrive in areas of high rainfall, but ticks are also found at inland locations.

### Illnesses and Signs & Symptoms

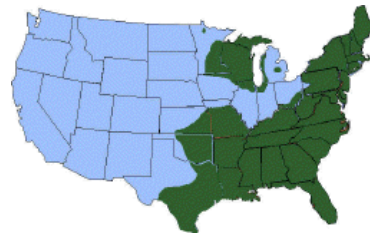
There are six notifiable tick-borne pathogens that cause human illness in the United States. These pathogens may be transmitted during a tick bite—normally hours after attachment. The illnesses, presented in approximate order of most common to least, include:

- Lyme (bacteria)
- RMSF (bacteria)
- Ehrlichiosis (bacteria)
- STARI (Southern Tick-Associated Rash Illness) (bacteria)
- Tularemia (Rabbit Fever) (bacteria)
- Babesia (protozoan parasite)

Symptoms will vary based on the illness, and may develop in infected individuals typically between 3 and 30 days after transmission. Some infected individuals will not become ill or may develop only mild symptoms. These illnesses present with some or all of the following signs & symptoms: fever, headache, muscle aches, stiff neck, joint aches, nausea, vomiting, abdominal pain, diarrhea, malaise, weakness, small solid, ring-like, or spotted rashes. The bite site may be red, swollen, or develop ulceration or lesions. For Lyme disease, the bite area will sometimes resemble a target pattern. A variety of long-term symptoms may result if the illness is left untreated, including debilitating effects and death.



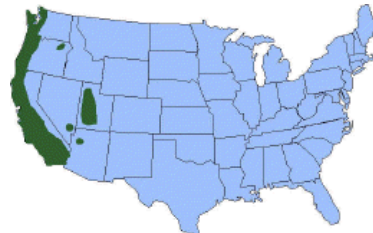
Deer Tick



Distribution of Deer Tick (dark green)



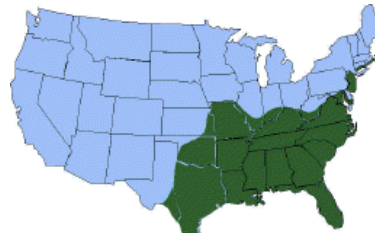
From Left: adult female, adult male, nymph, and larvae Deer Tick (cm scale)



Distribution of Pacific Deer Tick (dark green)



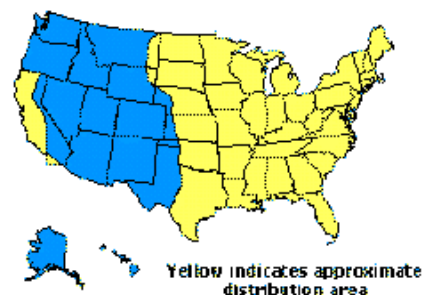
Lone Star Tick



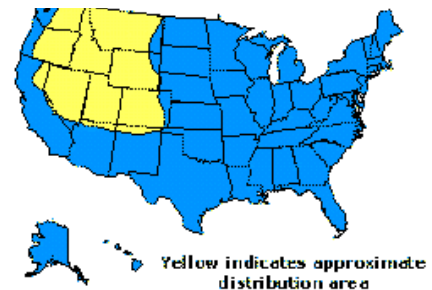
Distribution of Lone Star Tick (Green)



Dog Tick



Rocky Mountain Wood Tick





## Hazard Control

The methods for controlling exposure to ticks include, in order of most- to least-preferred:

- Avoiding tick habitats and ceasing operations in heavily infested areas
- Reducing tick abundance through habitat disruption or application of acaricide
- Personal protection through use of repellants and protective clothing
- Frequent tick inspections and proper hygiene

Vaccinations are not available and preventative antibiotic treatment after a bite is generally not recommended.

## Avoidance and Reduction of Ticks

To the extent practical, tick habitats should be avoided. In areas with significant tick infestation, consider stopping work and withdrawing from area until adequate tick population control can be achieved. Stopping and withdrawing should be considered as seriously as entering an area without proper energy control or with elevated airborne contaminants—tick-borne pathogens present risk of serious illness!

In areas where significant population density or infestation exists, tick reduction should be considered. Tick reduction can be achieved by disrupting tick habitats and/or direct population reduction through the use of tick-toxic pesticides (Damminix, Dursban, Sevin, etc.).

Habitat disruption may include only simple vegetative maintenance such as removing leaf litter and trimming grass and brush. Tick populations can be reduced by between 72 and 100 percent when leaf litter alone is removed. In more heavily infested areas, habitat disruption may include grubbing, tree trimming or removal, and pesticide application (Damminix, Dursban, Sevin, etc.). This approach is practical in smaller, localized areas or perimeter areas that require occasional access. Habitat controls are to be implemented with appropriate health and safety controls, in compliance with applicable environmental requirements, and may be best left to the property owner or tenant or to a licensed pesticide vendor. Caution should be exercised when using chemical repellents or pesticides in or around areas where environmental or industrial media samples will be collected for analysis.

## Personal Protection

After other prevention and controls are implemented, personal protection is still necessary to control exposure to ticks. Personal protection must include all of the following steps:

- So that ticks may be easily seen, wear light-colored clothing. Full-body New Tyvek (paper-like disposable coveralls) may also be used
- To prevent ticks from getting underneath clothing tuck pant legs into socks or tape to boots
- Wear long-sleeved shirts, a hat, and high boots
- Apply DEET repellent to exposed skin or clothing per product label
- Apply permethrin repellent to the outside of boots and clothing before wearing, per product label
- Frequently check for ticks and remove from clothing
- At the end of the day, search your entire body for ticks (particularly groin, armpits, neck, and head) and shower
- To prevent pathogen transmission through mucous membranes or broken/cut skin, wash or disinfect hands and/or wear surgical-style nitrile gloves any time ticks are handled

Pregnant individuals and individuals using prescription medications should consult with their physician and/or pharmacists before using chemical repellents. Because human health effects may not be fully known, use of chemical repellents should be kept to a minimum frequency and quantity.

Always follow manufacturers' use instructions and precautions. Wash hands after handling, applying, or removing protective gear and clothing. Avoid situations such as hand-to-face contact, eating, drinking, and smoking when applying or using repellents.

Remove and wash clothes per repellent product label. Chemical repellents should not be used on infants and children.

Vaccinations are generally not available for tick-borne pathogens. Although production of the LYMERix™ Lyme disease vaccination has been ceased, vaccination may still be considered under specific circumstances and with concurrence from the consulting physician.

### Tick Check

A tick check should be performed after field survey before entering the field vehicle (you do not want to infest your field vehicle with ticks). Have your field partner check your back; the backs of your legs, arms, and neck; and your hairline. Shake off clothing as thorough as possible before entering the vehicle. Once the field day is complete, repeat this procedure and perform a thorough self-check.

If a tick has embedded itself into the skin, remove the tick as described below.

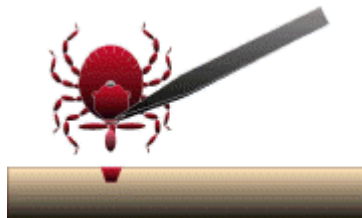
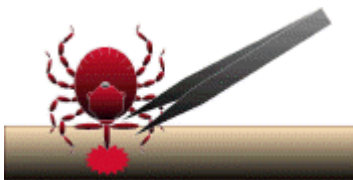
### Tick Removal

1. Use the tick removal kit obtained through the CH2M HILL Milwaukee warehouse, or a fine-tipped tweezers or shield your fingers with a tissue, paper towel, or nitrile gloves.



Tick Bites\Tick  
Remover.pdf

2. Grasp the tick as close to the skin surface as possible and pull upward with steady, even pressure. Do not twist or jerk the tick; this may cause the mouthparts to break off and remain in the skin. If this happens, remove mouthparts with tweezers. Consult your healthcare provider if infection occurs.



3. Avoid squeezing, crushing or puncturing the body of the tick because its fluids (saliva, hemolymph, gut contents) may contain infectious organisms. Releasing these organisms to the outside of the tick's body or into the bite area may increase the chance of infectious organism transmission.

4. Do not handle the tick with bare hands because infectious agents may enter through mucous membranes or breaks in the skin. This precaution is particularly directed to individuals who remove ticks from domestic animals with unprotected fingers. Children, elderly persons, and immunocompromised persons may be at greater risk of infection and should avoid this procedure.

5. After removing the tick, thoroughly disinfect the bite site and wash your hands with soap and water.

6. Should you wish to save the tick for identification, place it in a plastic bag, with the date of the tick bite, and place in your freezer. It may be used at a later date to assist a physician with making an accurate diagnosis (if you become ill).



**Note:** Folklore remedies such as petroleum jelly or hot matches do little to encourage a tick to detach from skin. In fact, they may make matters worse by irritating the tick and stimulating it to release additional saliva, increasing the chances of transmitting the pathogen. These methods of tick removal should be avoided. In addition, a number of tick removal devices have been marketed, but none are better than a plain set of fine tipped tweezers.

### First-Aid and Medical Treatment

Tick bites should always be treated with first-aid. Clean and wash hands and disinfect the bite site after removing embedded tick. Individuals previously infected with Lyme disease does not confer immunity—re-infection from future tick bites can occur even after a person has contracted a tick-borne disease.

The employee should contact the Injury Management/Return To Work provider (IMRTW), WorkCare using the toll-free number 866-893-2514 to report the tick bite. WorkCare will follow-up with each CH2M Hill employee who reports a tick bite and is at risk of developing Lyme disease by monitoring for symptoms up to 45 days, and will refer the employee to a medical provider for evaluation and treatment as necessary.

## 2013 Vehicle Accident Guidance—ESBG

Remember that if you are **renting** a non-CH2M HILL owned vehicle (short-term rental) in the U.S., you should carry the [insurance card](#) from the state where your driver's license is issued.

If you operate a **fleet vehicle**, carry the [insurance card](#) where the vehicle is registered.

### **For ALL Vehicles if you are in an accident:**

1. If you are injured, call 911 for emergency medical treatment or 1-866-893-2514 to contact the CH2M HILL Occupational Nurse/Physician for minor injuries. If you feel you have not been injured, contact the RHSM for guidance on whether calling the CH2M HILL Occupational Nurse/Physician is applicable.

2. **Call the Police**--For any vehicle accident/damage, it is recommended that the local police (or site security/emergency services if working on a client site that provides such services) be called to determine if a report needs to be filed. In some instances, a report may not be required (during accident alerts, or in public parking lots). Document that the authorities were called and follow up with any guidance they give you. State requirements vary. If a report is filed, obtain a copy.

3. Notify Supervisor, (and PM/RHSM if working on a project site)

4. Complete a HITS report on the VO.

### **Additional Steps**

To report an auto accident, and before a claim can be taken by telephonic reporting, have available your name (the company name alone is no longer accepted, a driver's name must be provided even for fender benders), location of accident and your office address if different than the accident location, business group and project number. A claim cannot be taken without your name, address, business group and your project number. By location the state where the accident occurred, and which office you are aligned to, i.e., accident occurs in Idaho, but you are out of the Denver office. Advise the claim recorder the accident occurred in ID, but that your office location is Denver. This will assist the claim intake person in identifying location coding for the claims.

### **Auto accidents involve two different sections of an Auto policy:**

- 1) Liability to others due to Bodily Injury and Property Damage
- 2) Physical Damage - Comprehensive and Collision - damage to the vehicle CH employee is driving

CH2M Hill has Liability coverage for any auto - our policy will respond on either a primary or excess basis.

Refer to the table below for additional notifications to make based on the type of accident experienced and vehicle being used.



## Liability - Bodily Injury or Property Damage to Others

Scenario	Which Coverage Responds	What to do if in an accident
CH2M Hill fleet, pool or project vehicle - long term lease - lower 48	CH2M Hill - Primary	Contact Broadspire (1-800-753-6737); Jennifer Rindahl/DEN (720-286-2449); Linda George/DEN (720-286-2057)
CH2M Hill fleet, pool or project vehicle - long term lease - Alaska (North Slope)	CH2M Hill - Primary	Contact Jennifer Rindahl/DEN (720-286-2449)
Client vehicle driven by CH2M Hill employee	Client's auto policy unless client has made CH2M Hill responsible for vehicle	Contact Broadspire (1-800-753-6737); Contact Jennifer Rindahl/DEN (720-286-2449); contact client;
Short term lease (30 days or less)	Rental car company if rented through Enterprise, Budget or Hertz; CH2M Hill excess	Contact Broadspire (1-800-753-6737); Contact local branch of rental car company where vehicle leased (ERAC includes 24 hour roadside assistance) and Jennifer Rindahl/DEN (720-286-2449)
Short term lease (30 days or less)	CH2M Hill - Primary if rented through company other than our national agreements; \$100,000 deductible	Contact Broadspire (1-800-753-6737); Contact rental car company and Jennifer Rindahl/DEN (720-286-2449)
Personal vehicle used on business	Employee's personal auto policy; CH2M Hill on an excess basis	Contact personal auto insurance company; contact Jennifer Rindahl/DEN (720-286-2449)

## Physical Damage - damage to vehicle CH employee was driving

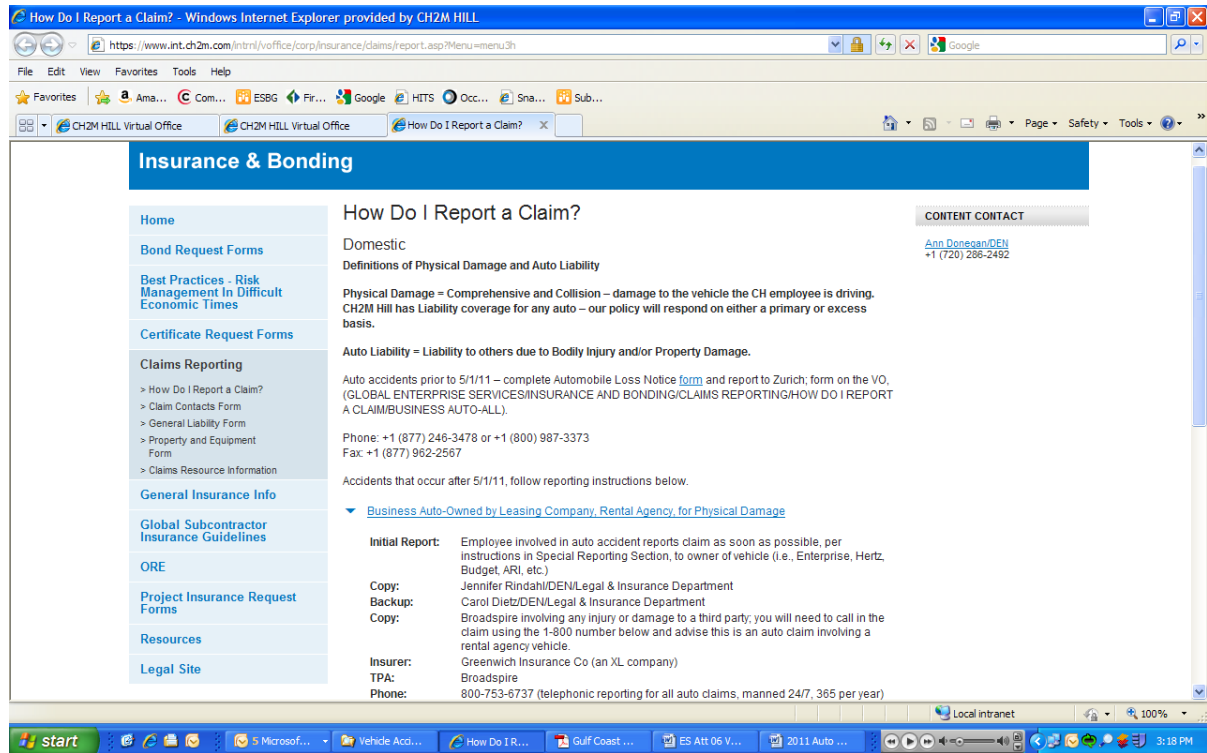
Scenario	Which Coverage Responds	What to do if in an accident
CH2M Hill fleet, pool or project vehicle - long term lease - lower 48	CH2M Hill ONLY if vehicle is scheduled on policy - \$5,000 deductible	Contact Broadspire (1-800-753-6737); Jennifer Rindahl/DEN (720-286-2449); Linda George/DEN (720-286-2057)
CH2M Hill fleet, pool or project vehicle - long term lease - Alaska (North Slope)	CH2M Hill Equipment Schedule if scheduled on policy	Contact Jennifer Rindahl/DEN (720-286-2449)
CH2M Hill fleet, pool or project vehicle - long term lease	ARI if physical damage coverage purchased - \$500 deductible	Contact Jennifer Rindahl/DEN 720.286.2449; call ARI at 1-800-221-1645 give them Client Code and ARI fleet vehicle number; and notify Linda George/DEN - Fleet Coordinator - 720-286-2057
Client vehicle CH2M Hill Employee is driving	Client's auto policy unless client has made CH2M Hill contractually responsible for vehicle	Contact Jennifer Rindahl/DEN (720-286-2449); contact client; contact Broadspire (1-800-753-6737)
Short term lease (30 days or less) using corporate VISA	VISA if corporate credit card used and vehicle is not a pickup, truck, cargo van or used off-road	Contact VISA - 1-800-847-2911 or <a href="http://www.visa.com/eclaim">http://www.visa.com/eclaim</a>
Short term lease (30 days or less) through Enterprise (ERAC) and vehicle is used off-road and physical damage coverage included when vehicle leased	ERAC up to \$3,000 in damage; CH2M Hill's coverage is excess	Notify Rental Car Company; contact Jennifer Rindahl/DEN (720-286-2449) if damage over \$5,000
Short term lease (30 days or less) did <b>not</b> use corporate VISA	CH2M Hill - \$5,000 deductible (project responsibility)	Contact Broadspire (1-800-753-6737); Contact Jennifer Rindahl/DEN 720-286-2449; contact VISA - 1-800-847-2911 or <a href="http://www.visa.com/eclaim">http://www.visa.com/eclaim</a>
Personal vehicle used on business	CH will reimburse the amount of the deductible carried on the employee's policy up to \$500 whichever is less	Contact Jennifer Rindahl/DEN (720-286-2449); contact client; contact Broadspire (1-800-753-6737)

Details for reporting a claim on the CH2M Hill VO are accessed by going to the VO home page and clicking:

GLOBAL ENTERPRISE SERVICES/INSURANCE & BONDING/CLAIMS REPORTING

HOW DO I REPORT A CLAIM TAB or access the following URL:

<https://www.int.ch2m.com/intrnl/voffice/corp/insurance/claims/report.asp?Menu=menu3h>



### **For Personally Owned Vehicles (POVs):**

CH2M HILL does not provide auto insurance for POVs, it is responsibility of the owner. If you are in a vehicle accident conducting company business, contact the police as above, supervisor, and 911 or CH2M HILL's occupational nurse/physician as stated above. Complete a HITS report. Contact Jennifer Rindahl/DEN for assistance for meeting personal insurance deductibles (up to \$500) with proof of insurance and deductible.

If using your POV for extended project use, notify the PM to make sure a rental car is not needed. Check your insurance policy for guidance on using the POV for business use.

### **Additional Resources:**

[Claims Resource Manual](#)



# TARGET ZERO BULLETIN

**Subject: HSSE Agency Inspections (OSHA, EPA, DOT, State Health Department)**

**Do you know what YOU would do if an agency inspector arrived at your site unannounced?**

Recently, a State Occupational Safety and Health Administration (OSHA) inspector made an unannounced visit to one of our Federal project sites. OSHA, U.S. Environmental Protection Agency (EPA), and authorized state or local agencies have authority to inspect any facility that is subject to health, safety, and environmental legislation. Inspections may be announced or unannounced. This particular inspector indicated that the project was targeted for an inspection because the work was funded by the American Recovery and Reinvestment Act (ARRA).

Enterprise Standard Operating Procedure (SOP) HSE-201, *Agency Inspections and Communications*, describes the responsibilities, procedures, and requirements associated with inspections conducted by external regulatory agencies, as well as the methods for communicating information to key individuals. This Target Zero Bulletin is a brief summary of what to do in the event of an agency inspection at your site. Refer to the SOP for more specific guidance.

## **Notification of Inspections**

- If the inspection is an announced regulatory agency inspection, the Project Manager (PM) should notify the Responsible Health and Safety Manager (RHSM) and Responsible Environmental Manager (REM) well in advance of the inspection.
- If an unannounced agency inspector visits one of our projects, Field personnel must immediately notify the project Emergency Response Coordinator (ERC). Typically the ERC is the Safety Coordinator (SC).
- The **ERC must immediately notify the RHSM/REM**, as appropriate, of unannounced inspections, or designate someone to call the RHSM/REM. The RHSM/REMs can provide guidance to the field staff and PM.

## **Inspector Credential Verification**

- Upon arrival, the ERC must request the inspector to provide official credentials. Record the inspector's name and office phone number or obtain the inspector's business card.
- The inspector shall sign the visitors log and be given a site-specific health, safety, and environmental protection briefing.
- The inspector shall meet any site access requirements associated with security clearances, specialized training, and medical monitoring. The CH2M HILL representative shall verify that the inspector possesses these requirements; access will only be granted to those areas where appropriate access requirements are met. Some inspectors have the authority to gain access to any work area at any time, such as an inspector with a search warrant. In these cases, we can stop work operations as necessary to protect the safety of the inspector(s).

## **Opening Conference**

- The CH2M HILL Project Manager, ERC, RHSM, or REM, and the inspector shall determine attendees for the opening conference. The RHSM (for OSHA and other worker health and safety inspections) or REM (for environmental inspections) shall join the opening conference via conference call.
- The inspector shall inform CH2M HILL of the purpose of the inspection and provide a copy of the complaint, if applicable.

- The inspector shall outline the scope of the inspection, including employee interviews conducted in private, physical inspection of the workplace and records, possible referrals, discrimination complaints, and the closing conference(s).

#### **Requests for OSHA Logs**

- An OSHA inspector may request to review the project OSHA Injury/Illness log, better known as the OSHA 300 Log. Contact your RHSM for assistance in obtaining the OSHA 300 Log.
- Field projects with a continuous duration of one year or longer are considered to be separate establishments and are required to maintain an OSHA 300 log specific to the project. The project OSHA 300 log should be maintained onsite and kept current.
- Recordable injuries and illnesses sustained on field projects less than one year in duration are maintained on the CH2M HILL office log where the injured employee is based.

#### **The Inspection**

- The scope of the inspection shall be limited to that indicated by the inspector in the opening conference. The inspector shall be escorted to relevant areas only. The ERC or other designated by the RHSM or REM must accompany the inspector during the inspection.
- Ensure that the inspection is limited to the scope that the inspector disclosed during the opening conference. The ERC should always take notes which identify: areas inspected, machinery or equipment and materials examined, employees or other persons interviewed, and photographs taken by the inspector.
- The inspector will observe safety, health, and environmental conditions and practices and document the inspection process. The inspector may also take photos and instrument readings, examine records, collect air samples, measure noise levels, survey existing engineering controls, and monitor employee exposure to toxic vapors, gases, and dusts.
- CH2M HILL should gather duplicate information (photographs, readings, samples) in the same manner and condition as the inspector. If the equipment needed to take duplicate samples is not onsite, ask the inspector if the sampling can wait until the equipment is available. If samples are taken, request a description of the tests that the agency intends to perform on the samples and request results as soon as they are available.
- Employees may be questioned during the inspection tour. The employee can refuse to speak to an inspector, can speak to the inspector with a company representative (including management) present, or can speak to the inspector privately. It is CH2M HILL policy that employees who wish to speak to the inspector are not discriminated against, intimidated, or otherwise mistreated for exercising their rights during compliance inspections.
- Copies of documents should not be provided to the inspector without the approval of the RHSM or REM or Legal Insurance Department (LID). **DO NOT** voluntarily release documents. Respond only to inspection team requests.
- During the course of the inspection, the inspector may point out violations. For each violation, the CH2M HILL representative should ask the inspector to discuss possible corrective action. Where possible, violations detected by the inspector should be corrected immediately and noted by the inspector as corrected.
- For those items which cannot be corrected immediately, an action plan shall be formulated for timely correction. In any instance, employees exposed to hazards shall be removed from the area.

### **Closing Conference**

After the inspection, a closing conference is normally held as follows:

- The CH2M HILL PM, ERC, RHSM or REM shall be involved via conference call in the closing conference, at a minimum;
- The inspector shall describe the apparent violations found during the inspection and other pertinent issues as deemed necessary by the inspector. CH2M HILL shall be advised of their rights to participate in any subsequent conferences, meetings or discussions. Any unusual circumstances noted during the closing conference shall be documented by the ERC;
- The inspector shall discuss violations observed during the inspection and indicate for which violations a citation and a proposed penalty may be issued or recommended;
- The ERC shall request receipts for all samples and approved documents photocopied by the inspector, request a photocopy of the inspector's photograph log, and request a copy of the final inspection report; and
- Any documentation from an agency inspection must be transmitted immediately to the RHSM or REM, and LID.

**Unannounced regulatory agency inspections may happen at any time on our projects -**

**Get your RHSM/REM and PM involved immediately if an Inspector arrives**

**Attachment D**  
**Project Activity Self-Assessment Checklists**

---



## Attachment 5: HSE Self-Assessment Checklist-Earthmoving Equipment

This checklist shall be used by CH2M HILL personnel **only** and shall be completed at the frequency specified in the project's HSP/FSI.

This checklist is to be used at locations where: 1) CH2M HILL employees are potentially exposed to the hazards of earthmoving equipment operations, 2) CH2M HILL employees are operating earthmoving equipment, and/or 3) CH2M HILL provides oversight of a subcontractor operating earthmoving equipment.

The CH2M HILL Safety Coordinator may consult with subcontractors operating earthmoving equipment when completing this checklist, but shall not direct the means and methods of equipment operations nor direct the details of corrective actions. Earthmoving equipment subcontractors shall determine how to correct deficiencies and we must carefully rely on their expertise. Items considered to be imminently dangerous (possibility of serious injury or death) shall be corrected immediately or all exposed personnel shall be removed from the hazard until corrected.

Project Name: \_\_\_\_\_ Project No.: \_\_\_\_\_  
Location: \_\_\_\_\_ PM: \_\_\_\_\_  
Auditor: \_\_\_\_\_ Title: \_\_\_\_\_ Date: \_\_\_\_\_

This specific checklist has been completed to:

- ☐ Evaluate CH2M HILL employee exposures to earthmoving equipment hazards (complete Section 1).
- ☐ Evaluate CH2M HILL employees operating earthmoving equipment (complete entire checklist).
- ☐ Evaluate CH2M HILL subcontractor's compliance with earthmoving equipment safety requirements (complete entire checklist). Subcontractors Name: \_\_\_\_\_

- Check "Yes" if an assessment item is complete/correct.
- Check "No" if an item is incomplete/deficient. Deficiencies shall be brought to the immediate attention of the earthmoving equipment subcontractor. Section 3 must be completed for all items checked "No."
- Check "N/A" if an item is not applicable.
- Check "N/O" if an item is applicable but was not observed during the assessment.

Numbers in parentheses indicate where a description of this assessment item can be found in Standard of Practice HSE-306.

**SAFE WORK PRACTICES (5.1)****SECTION 1****Yes No N/A N/O**

1. Personnel maintaining safe distance from operating equipment
2. Positioning personnel in close proximity to operating equipment is avoided
3. Personnel wearing high-visibility and/or reflective vests when close to operating equipment
4. Personnel approach operating equipment safely
5. Personnel riding only in seats of equipment cab and using seat belts
6. Personnel not positioned under elevated portions of equipment
7. Personnel not positioned under hoisted loads
8. Personnel not hoisted by equipment
9. Personnel do not to approach equipment that has become electrically energized
10. Personnel wearing appropriate PPE, per HSP/FSI

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

<b>EQUIPMENT SAFETY REQUIREMENTS PRIOR TO OPERATING EQUIPMENT (5.2.1)</b>	<b><u>SECTION 2</u></b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>	<b>N/O</b>
11. Only qualified and authorized personnel operating equipment		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. Daily safety briefing/meeting conducted with equipment operators		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. Daily inspection of equipment conducted and documented		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. Modifications and attachments used approved by equipment manufacturer		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. Backup alarm or spotter used when backing equipment		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16. Operational horn provided on bi-directional equipment		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. Seat belts are provided and used		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18. Rollover protective structures (ROPS) provided		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19. Braking system capable of stopping full payload		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20. Headlights and taillights operable when additional light required		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21. Brake lights in operable condition		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22. Cab glass provides no visible distortion to the operator		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
23. All machine guards are in place		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
24. Hauling equipment (dump trucks) provided with cab shield or canopy		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25. Dump truck beds provided with positive means of support during maintenance or inspection		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
26. Dump truck operating levers provided with latch to prevent accidental dumping		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
27. Air monitoring conducted per HSP/FSI for hazardous atmospheres		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>EQUIPMENT PLACEMENT (5.2.2)</b>					
28. Equipment position on firm/level surface, outriggers used		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
29. Location of underground utilities identified		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
30. Safe clearance distance maintained while working under overhead power lines		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
31. Safe distance is maintained while traveling under power lines		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
32. Warning system used to remind operator of excavation edge		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
33. Unattended equipment visibly marked at night		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
34. Tools lowered/parking brake set when not in use, wheels chocked when parked on incline		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>EQUIPMENT OPERATION (5.2.3)</b>					
35. Equipment operated on safe roadways and grades		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
36. Equipment operated at safe speed		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
37. Operators maintain unobstructed view of travel path		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
38. Equipment not operated during inclement weather, lightning storms		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
39. Equipment started and moved safely		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
40. Operators keep body parts inside cab during operation		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
41. Vehicle occupants in safe position while loading/unloading		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
42. Signal person visible to operator when required		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
43. Equipment used for hoisting done according to equipment manufacturer specifications		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
44. Lifting and hauling capacities are not exceeded		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>EQUIPMENT MAINTENANCE (5.2.4)</b>					
45. Defective components repaired immediately		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
46. Suspended equipment or attachments supported prior to work under or between		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
47. Lockout/tagout procedures used prior to maintenance		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
48. Tires on split rims removed using safety tire rack or cage		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
49. Good housekeeping maintained on and around equipment		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

### SECTION 3

Complete this section for all items checked “No” in Sections 1 or 2. Deficient items must be corrected in a timely manner.

[illegible]

Auditor: \_\_\_\_\_ Project Manager: \_\_\_\_\_



## Attachment 2: HS&E Self-Assessment Checklist—Excavations

This checklist shall be used by CH2M HILL personnel only and shall be completed at the frequency specified in the project's Health and Safety Plan/Field Safety Instruction (HSP/FSI).

This checklist is to be used at locations where: 1) CH2M HILL employees enter excavations (complete Sections 1 and 3), and/or 2) CH2M HILL oversight of an excavation subcontractor is required (complete entire checklist).

The SSC may consult with excavation subcontractors when completing this checklist, but shall not direct the means and methods of excavation operations nor direct the details of corrective actions. Excavation subcontractors shall determine how to correct deficiencies and we must rely on their expertise. Conditions considered imminently dangerous (possibility of serious injury or death) shall be corrected immediately or all exposed personnel shall be removed from the hazardous area until the situation is corrected.

Project Name: \_\_\_\_\_ Project No.: \_\_\_\_\_

Location: \_\_\_\_\_ PM: \_\_\_\_\_

Auditor: \_\_\_\_\_ Title: \_\_\_\_\_ Date: \_\_\_\_\_

This specific checklist has been completed to:

- ☐ Evaluate CH2M HILL employee exposures to excavation hazards  
☐ Evaluate a CH2M HILL subcontractor's compliance with excavation HS&E requirements  
Subcontractor Name: \_\_\_\_\_

- Check "Yes" if an assessment item is complete/correct.
- Check "No" if an item is incomplete/deficient. Deficiencies shall be brought to the immediate attention of the excavation subcontractor. Section 3 must be completed for all items checked "No."
- Check "N/A" if an item is not applicable.
- Check "N/O" if an item is applicable but was not observed during the assessment.

### SECTION 1

Yes   No   N/A   N/O

#### **EXCAVATION ENTRY REQUIREMENTS (4.1)**

- |   |                          |                          |                          |                          |
|---|--------------------------|--------------------------|--------------------------|--------------------------|
| 1. Personnel have completed excavation safety training                                      | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2. Competent person has completed daily inspection and has authorized entry                 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 3. Personnel are aware of entry requirements established by competent person                | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 4. Protective systems are free from damage and in stable condition                          | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 5. Surface objects/structures secured from falling into excavation                          | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 6. Potential hazardous atmospheres have been tested and found to be at safe levels          | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 7. Precautions have been taken to prevent cave-in from water accumulation in the excavation | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 8. Personnel wearing appropriate, PPE per HSP/SI  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

<b>SECTION 2</b>		<b><u>Yes</u></b>	<b><u>No</u></b>	<b><u>N/A</u></b>	<b><u>N/O</u></b>
<b>GENERAL (4.2.1)</b>					
9. Daily safety briefing/meeting conducted with personnel		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Excavation and protective systems adequately inspected by competent person		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. Defective protective systems or other unsafe conditions corrected before entry		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. Guardrails provided on walkways over excavation 6 ft (1.8m) or deeper		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. Barriers provided at excavations 6 ft or deeper when excavation not readily visible		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. Barriers or covers provided for wells, pits, shafts, or similar excavation 6 ft (1.8 m) or deeper		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. Earthmoving equipment operated safely (use earthmoving equipment checklist in HSE-306)		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>PRIOR TO EXCAVATING (4.2.2)</b>					
16. Dig Permit obtained where required by client/facility		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. Location of underground utilities and installations identified		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>EXCAVATING ACTIVITIES (4.2.3)</b>					
26. Rocks, trees, and other unstable surface objects removed or supported		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
27. Exposed underground utility lines supported		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
28. Undermined surface structures supported or determined to be in safe condition		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
29. Warning system used to remind equipment operators of excavation edge		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>EXCAVATION ENTRY (4.2.4)</b>					
32. Trenches > 4 ft (1.2 m) deep provided with safe means of egress within 25 ft (7.6 m)		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
33. Structure ramps designed and approved by competent person		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
34. Potential hazardous atmospheres tested prior to entry		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
35. Rescue equipment provided where potential for hazardous atmosphere exists		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
36. Ventilation used to control hazardous atmosphere and air tested frequently		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
37. Appropriate respiratory protection used when ventilation does not control hazards		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
38. Precautions taken to prevent cave-in resulting from water accumulation in excavation		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
39. Precautions taken to prevent surface water from entering excavation		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
40. Protection provided from falling/rolling material originating from excavation face		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
41. Spoil piles, equipment, materials restrained or kept at least 2 ft (61 cm) from excavation edge		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>EXCAVATION PROTECTIVE SYSTEMS (4.2.5)</b>					
42. Protective systems used for excavations 5 ft (1.5 m) or deeper, unless in stable rock		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
43. Protective systems for excavation deeper than 20 ft (6.1 m) designed by registered PE		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
44. If soil unclassified, maximum allowable slope is 34 degrees		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
45. Protective systems free from damage		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
46. Protective system used according to manufacturer's recommendations and not subjected to loads exceeding design limits		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
47. Protective system components securely connected to prevent movement or failure		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
48. Cave-in protection provided while entering/exiting shielding systems		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
49. Personnel removed from shielding systems when installed, removed, or if vertical movement		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		<b><u>Yes</u></b>	<b><u>No</u></b>	<b><u>N/A</u></b>	<b><u>N/O</u></b>
<b>PROTECTIVE SYSTEM REMOVAL AND BACKFILLING (4.2.6)</b>					
50. Protective system removal starts and progresses from excavation bottom		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
51. Protective systems removed slowly and cautiously		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
52. Temporary structure supports used if failure of remaining components observed		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
53. Backfilling takes place immediately after protective system removal		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Complete this section for all items checked “No” in Sections 1 or 2. Deficient items must be corrected in a timely manner.

Auditor: \_\_\_\_\_ Project Manager: \_\_\_\_\_

This checklist shall be used by CH2M HILL personnel **only** and shall be completed at the frequency specified in the project's HSP/FSI.

This checklist is to be used at locations where: (1) CH2M HILL employees are exposed to hand and power tool hazards and/or (2) CH2M HILL provides oversight of subcontractor personnel who are exposed to hand and power tool hazards.

SC may consult with subcontractors when completing this checklist, but shall not direct the means and methods of hand and power tool use nor direct the details of corrective actions. Subcontractors shall determine how to correct deficiencies and we must carefully rely on their expertise. Items considered to be imminently dangerous (possibility of serious injury or death) shall be corrected immediately or all exposed personnel shall be removed from the hazard until corrected.

Project Name: \_\_\_\_\_ Project No.: \_\_\_\_\_  
 Location: \_\_\_\_\_ PM: \_\_\_\_\_  
 Auditor: \_\_\_\_\_ Title: \_\_\_\_\_ Date: \_\_\_\_\_

This specific checklist has been completed to:

- ☐ Evaluate CH2M HILL employee exposure to hand and power tool hazards.  
☐ Evaluate a CH2M HILL subcontractor's compliance with hand and power tool requirements.  
 Subcontractors Name: \_\_\_\_\_

- Check "Yes" if an assessment item is complete/correct.
- Check "No" if an item is incomplete/deficient. Deficiencies shall be brought to the immediate attention of the subcontractor. Section 3 must be completed for all items checked "No."
- Check "N/A" if an item is not applicable.
- Check "N/O" if an item is applicable but was not observed during the assessment.

Numbers in parentheses indicate where a description of this assessment item can be found in Standard of Practice HSE-210.

### **SECTION 1**

**Yes No N/A N/O**

#### **SAFE WORK PRACTICES (5.1)**

- |   |                          |                          |                          |                          |
|---|--------------------------|--------------------------|--------------------------|--------------------------|
| 1. All tools operated according to manufacturer's instructions and design limitations.                | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2. All hand and power tools maintained in a safe condition and inspected and tested before use.       | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 3. Defective tools are tagged and removed from service until repaired.                                | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 4. PPE is selected and used according to tool-specific hazards anticipated.                           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 5. Power tools are not carried or lowered by their cord or hose.                                      | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 6. Tools are disconnected from energy sources when not in use, servicing, cleaning, etc.              | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 7. Safety guards remain installed or are promptly replaced after repair.                              | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 8. Tools are stored properly.   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 9. Cordless tools and recharging units both conform to electrical standards and specifications.       | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 10. Tools used in explosive environments are rated for such use.                                      | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 11. Knife or blade hand tools are used with the proper precautions.                                   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 12. Consider controls to avoid muscular skeletal, repetitive motion, and cumulative trauma stressors. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

**SECTION 2****Yes No N/A N/O****GENERAL (5.2.2)**

- |  |                          |                          |                          |                          |
|--|--------------------------|--------------------------|--------------------------|--------------------------|
| 13. PPE is selected and used according to tool-specific hazards anticipated.           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 14. Tools are tested daily to assure safety devices are operating properly.            | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 15. Damaged tools are removed from service until repaired.                             | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 16. Power operated tools designed to accommodate guards have guards installed.         | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 17. Rotating or moving parts on tools are properly guarded.                            | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 18. Machines designed for fixed locations are secured or anchored.                     | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 19. Floor and bench-mounted grinders are provided with properly positioned work rests. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 20. Guards are provided at point of operation, nip points, rotating parts, etc.        | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 21. Fluid used in hydraulic-powered tools is approved fire-resistant fluid.            | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

**ELECTRIC-POWERED TOOLS (5.2.3)**

- |   |                          |                          |                          |                          |
|---|--------------------------|--------------------------|--------------------------|--------------------------|
| 22. Electric tools are approved double insulated or grounded and used according to SOP HSE-206.       | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 23. Electric cords are not used for hoisting or lowering tools.                                       | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 24. Electric tools are used in damp/ wet locations are approved for such locations or GFCI installed. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 25. Hand-held tools are equipped with appropriate on/off controls appropriate for the tool.           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 26. Portable, power-driven circular saws are equipped with proper guards.                             | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

**ABRASIVE WHEEL TOOLS (5.2.4)**

- |  |                          |                          |                          |                          |
|--|--------------------------|--------------------------|--------------------------|--------------------------|
| 27. All employees using abrasive wheel tools are wearing eye protection.                   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 28. All grinding machines are supplied with sufficient power to maintain spindle speed.    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 29. Abrasive wheels are closely inspected and ring-tested before use.                      | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 30. Grinding wheels are properly installed.  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 31. Cup-type wheels for external grinding are protected by the proper guard or flanges.    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 32. Portable abrasive wheels used for internal grinding are protected by safety flanges.   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 33. Safety flanges are used only with wheels designed to fit the flanges.                  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 34. Safety guards on abrasive wheel tools are mounted properly and of sufficient strength. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

**PNEUMATIC-POWERED TOOLS (5.2.5)**

- |  |                          |                          |                          |                          |
|--|--------------------------|--------------------------|--------------------------|--------------------------|
| 35. Tools are secured to hoses or whip by positive means to prevent disconnection.                   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 36. Safety clips or retainers are installed to prevent attachments being expelled.                   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 37. Safety devices are installed on automatic fastener feed tools as required.                       | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 38. Compressed air is not used for cleaning unless reduced to < 30 psi, with PPE, and guarded.       | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 39. Manufacturer's safe operating pressure for hoses, pipes, valves, etc. are not exceeded.          | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 40. Hoses are not used for hoisting or lowering tools.   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 41. All hoses >1/2-inch diameter have safety device at source to reduce pressure upon hose failure.  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 42. Airless spray guns have required safety devices installed.                                       | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 43. Blast cleaning nozzles are equipped with operating valves, which are held open manually.         | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 44. Supports are provided for mounting nozzles when not in use.                                      | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 45. Air receiver drains, handholes, and manholes are easily accessible.                              | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 46. Air receivers are equipped with drainpipes and valves for removal of accumulated oil and water.  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 47. Air receivers are completely drained at required intervals.                                      | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 48. Air receivers are equipped with indicating pressure gauges.                                      | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 49. Safety, indicating, and controlling devices are installed as required.                           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 50. Safety valves are tested frequently and at regular intervals to assure good operating condition. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

**HSE Self-Assessment Checklist—HAND AND POWER TOOLS**

Page 3 of 4

**SECTION 2 (continued)****Yes No N/A N/O****LIQUID FUEL-POWERED TOOLS (5.2.6)**

- |   |                          |                          |                          |                          |
|---|--------------------------|--------------------------|--------------------------|--------------------------|
| 51. Liquid fuel-powered tools are stopped when refueling, servicing, or maintaining.                | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 52. Liquid fuels are stored, handled, and transported in accordance with SOP HSE-403                | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 53. Liquid fuel-powered tools are used in confined spaces in accordance with SOP HSE-203.           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 54. Safe operating pressures of hoses, valves, pipes, filters, and other fittings are not exceeded. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

**POWDER-ACTUATED TOOLS (5.2.7)**

- |  |                          |                          |                          |                          |
|--|--------------------------|--------------------------|--------------------------|--------------------------|
| 55. Only trained employee operates powder-actuated tools.  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 56. Powder-actuated tools are not loaded until just prior to intended firing time.                 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 57. Tools are not pointed at any employee at any time.   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 58. Hands are kept clear of open barrel end.   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 59. Loaded tools are not left unattended.  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 60. Fasteners are not driven into very hard or brittle materials.                                  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 61. Fasteners are not driven into easily penetrated materials unless suitable backing is provided. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 62. Fasteners are not driven into spalled areas.   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 63. Powder-actuated tools are not used in an explosive or flammable atmosphere.                    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 64. All tools are used with correct shields, guards, or attachments recommended by manufacturer.   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

**JACKING TOOLS (5.2.8)**

- |   |                          |                          |                          |                          |
|---|--------------------------|--------------------------|--------------------------|--------------------------|
| 65. Rated capacities are legibly marked on jacks and not exceeded.                        | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 66. Jacks have a positive stop to prevent over-travel.                                    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 67. The base of jacks are blocked or cribbed to provide a firm foundation, when required. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 68. Wood blocks are place between the cap and load to prevent slippage, when required.    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 69. After load is raised, it is cribbed, blocked, or otherwise secured immediately.       | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 70. Antifreeze is used when hydraulic jacks are exposed to freezing temperatures.         | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 71. All jacks are properly lubricated.  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 72. Jacks are inspected as required.  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 73. Repair or replacement parts are examined for possible defects.                        | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 74. Jacks not working properly are removed from service and repaired or replaced.         | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

**HAND TOOLS (5.2.9)**

- |  |                          |                          |                          |                          |
|--|--------------------------|--------------------------|--------------------------|--------------------------|
| 75. Wrenches are not used when jaws are sprung to the point of slippage.                         | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 76. Impact tools are kept free of mushroomed heads.  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 77. Wooden handles of tools are kept free of splinters or cracks and are tightly fitted in tool. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

**CHAIN SAWS (5.2.10)**

- |   |                          |                          |                          |                          |
|---|--------------------------|--------------------------|--------------------------|--------------------------|
| 78. Chainsaw equipped with spark arrestor and fully functioning chain brake                   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 79. Chainsaw operator's manual readily available  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 80. Fully stocked first aid kit and multipurpose fire extinguisher available                  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 81. Appropriate personal protective equipment available and worn                              | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 82. Clothing free of loose edges that could become entangled in the saw                       | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 83. Chainsaw handles kept dry, clean, and free of oil or fuel mixture                         | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 84. Chainsaws held firmly with both hands and used right-handed                               | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 85. Operator standing to the left of the saw out of the plane of the chain                    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 86. Saw used between the waist and mid-chest level  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 87. Full throttle maintained while cutting  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 88. Operator aware of position of guide bar tip, does not contact tip with anything being cut | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 89. Bumper spikes maintained as close to the object as possible                               | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 90. Operator aware of what is in the saw's downward path after the cut                        | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 91. No attempt to made to cut material that is larger than the guide bar of the saw           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 92. Cuts avoided that will cause chain to jam   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 93. Non-metallic wedges used to prevent compression cuts from jamming the blade               | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 94. Bystanders and helpers kept at a safe distance from operation                             | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 95. Chainsaw not operated when fatigued   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 96. Fire extinguisher present when operating the chainsaw in forest or brushy areas           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

[illegible]

Auditor: \_\_\_\_\_ Project Manager: \_\_\_\_\_

This checklist is provided as a method of verifying compliance with regulations pertaining to the handling of hazardous materials. It shall be used at locations where CH2M HILL employees handle hazardous materials, or are required to perform oversight of subcontractor personnel handling hazardous materials, or both.

CH2M HILL staff shall not direct the means and methods of subcontractor operations nor direct the details of corrective actions. The subcontractor must determine how to correct deficiencies, and CH2M HILL staff must carefully rely on the subcontractor's expertise. Items considered imminently dangerous (possibility of serious injury or death) must be corrected immediately, or all exposed personnel must be removed from the hazard until it is corrected.

Completed checklists must be sent to the appropriate regional health and safety program manager for review.

Project Name: \_\_\_\_\_ Project No.: \_\_\_\_\_  
 Location: \_\_\_\_\_ PM: \_\_\_\_\_  
 Auditor: \_\_\_\_\_ Title: \_\_\_\_\_ Date: \_\_\_\_\_

This specific checklist has been completed to (check only one of the boxes below):

- ☐ Evaluate CH2M HILL compliance with hazardous material handling requirements (SOP HSE-403)  
☐ Evaluate a CH2M HILL subcontractor's compliance with hazardous material requirements  
 Subcontractor's Name: \_\_\_\_\_

- Check "Yes" if an assessment item is complete or correct.
- Check "No" if an item is incomplete or deficient. Section 2 must be completed for all items checked "No."
- Check "N/A" if an item is not applicable.
- Check "N/O" if an item is applicable but was not observed during the assessment.

Numbers in parentheses indicate where a description of this assessment item can be found in Standard of Practice HSE-403.

	<u>Yes</u>	<u>No</u>	<u>N/A</u>	<u>N/O</u>
<b><u>SECTION 1</u></b>				
<b>PROCEDURES FOR HAZARDOUS MATERIAL HANDLING (6.0)</b>				
<b>GENERAL GUIDELINES (6.1)</b>				
1. Acids are stored away from bases.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Oxidizers and organics are stored away from inorganic reducing agents.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Flammables and corrosives are stored in appropriate storage cabinets.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Paper and other combustibles are not stored near flammables.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Secondary containment and lipped shelving are in place in storage areas.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. A fire suppression system is available.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>SPILL CONTROL/CLEANUP (6.2)</b>				
7. Spill control materials are located on the project site.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>HAZARDOUS CHEMICAL INVENTORY REPORTING (6.3)</b>				
8. Reporting is required if the project site handles and stores 10,000 lb or more of a hazardous chemical.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Or 500 lb or the threshold planning quantity (TPQ) of an extremely hazardous substance.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Regional ECC has been consulted for hazardous chemical inventory reporting.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>TOXIC CHEMICAL RELEASE REPORTING</b>				
11. Reporting requirements for toxic chemical release reporting have been followed.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



<b>SECTION 1 (continued)</b>		<b>Yes</b>	<b>No</b>	<b>N/A</b>	<b>N/O</b>
<b>FLAMMABLE AND COMBUSTIBLE LIQUIDS (6.5)</b>					
<b>GENERAL STORAGE (6.5.1)</b>					
12. Only approved containers/portable tanks used to store flammable and combustible liquids.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. Approved safety cans used for handling flammable liquids in quantities 1-5 gallons.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. For quantities of one gallon or less, the original container must be used for storage.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. Flammable or combustible liquids are not stored in stairways or personnel passageways.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>INDOOR STORAGE (6.5.2)</b>					
16. Quantities of flammable or combustible liquids > 25 gallons stored in approved storage cabinet.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. No more than 25 gallons of flamm. or comb. liquids can be stored outside an approved cabinet.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18. Cabinets are labeled with "FLAMMABLE: KEEP FIRE AWAY."	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19. No more than 60 gallons of flamm. or 120 gallons of comb. liquids stored in one storage cabinet.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20. Not more than three cabinets located in a single storage area.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>OUTSIDE STORAGE (6.5.3)</b>					
21. Storage of containers (not more than 60 gallons each) do not exceed 1,100 gallons in any area.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22. Storage areas are not within 20 feet of any building.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
23. Storage areas graded to divert spills away from buildings and surrounded by an earth dike.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
24. Storage areas are free from weeds, debris, and other combustible materials.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25. Outdoor portable tanks are provided with emergency vent devices.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
26. Outdoor portable tanks are no closer than 20 feet from any building.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
27. Signs indicating no smoking are posted around the storage area.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>DISPENSING (6.5.4)</b>					
28. Areas where liquids are dispensed in >5-gal quantities are separated from other operations by 25'.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
29. Drainage or other means provided to control spills.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
30. Adequate natural or mechanical ventilation provided to maintain concentration of flammable vapor < 10% of the lower flammable limit.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
31. Dispensing of flammable liquids from one container to another is done only when containers are electrically interconnected (bonded).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
32. Dispensing flammable or combustible liquids by means of air pressure on the container or portable tanks prohibited.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
33. Dispensing devices and nozzles for flammable liquids are of an approved type.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>USE (6.5.5)</b>					
34. Flammable liquids are kept in closed containers when not in actual use.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
35. Leakage or spillage of flammable or combustible liquids is disposed of promptly and safely.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
36. Sources of ignition are kept at least 50 feet from flammable liquids.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>LIQUID PETROLEUM GAS (6.6)</b>					
37. LPG containers meet DOT requirements.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
38. Each container or system has a safety relief device or valve in good working order.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
39. Portable heaters using LPG have an automatic shutoff device in the event of flame failure.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
40. Storage of LPG within buildings is prohibited.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
41. LPG storage location has at least one portable fire extinguisher rated not less than 20-B:C.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

<b>SECTION 1 (continued)</b>		<b>Yes</b>	<b>No</b>	<b>N/A</b>	<b>N/O</b>
<b>COMPRESSED GAS CYLINDERS (6.7)</b>					
<b>GENERAL (6.7.1)</b>					
42. Cylinders and apparatus inspected for defects and leakage prior to use. Damaged items not used.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
43. Gas distributor notified and subsequent instructions followed for defective cylinders.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
44. Leaking cylinders removed from the work area.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
45. Cylinder users do not modify, tamper, or attempt repair on cylinders or apparatus.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
46. Only cylinder owners or authorized agent refill cylinders or attempt to mix gases in a cylinder.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
47. Cylinders labeled with the identity of the contents.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<b>TRANSPORTING (6.7.2)</b>					
48. Cylinders not rolled in the horizontal position or dragged; suitable material-handling device used.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
49. Cylinders being transported have valve protection caps installed.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
50. Cylinders in vertical position when transported by motor vehicle, hoisted, or carried.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
51. Cylinders hoisted by a cradle or pallet designed for such use, and not by magnets, slings, or their valve protection caps.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<b>STORAGE (6.7.3)</b>					
52. Cylinders are stored in the vertical position with valve protection caps installed.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
53. Cylinders are secured from being knocked over by a chain or other stabilizing device.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
54. Cylinders are stored away from readily ignitable substances.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
55. Cylinders are protected from exposure to temperature extremes.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
56. Oxygen cylinders in storage are separated from fuel gas cylinders or combustible materials > 20' or by a ½-hour fire-resistant barrier at least 5' high.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
57. Cylinders inside buildings are stored in dry, well-ventilated locations > 20' from comb. materials.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
58. Cylinders are stored in definitely assigned places away from elevators, stairs, or gangways.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
59. Signs indicating no smoking are provided for storage areas containing flammable gas cylinders.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<b>PLACEMENT FOR USAGE (6.7.4)</b>					
60. Cylinders are located where they will not be knocked over or damaged.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
61. Cylinders are secured in the vertical position.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
62. Cylinders are not placed where they can become part of an electrical circuit.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
63. Cylinders are kept far enough away from welding and cutting operations to prevent sparks, hot slag, or flames from reaching them. When impractical, fire resistant shields are provided.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
64. Cylinders are not taken into confined spaces.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<b>CYLINDER CONNECTIONS (6.7.5)</b>					
65. Pressure-controlling apparatus is compatible with the particular gas used.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
66. Cylinders and pressure-controlling apparatus are kept free of oil and grease.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
67. Pressure-controlling apparatus is kept gastight to prevent leakage.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
68. Cylinders not attached to process where backflow could occur unless check valves or traps used.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
69. Manifolds designed for product used at the appropriate temperatures, pressures, and flow rates.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
70. Manifolds are labeled and placed in well-ventilated and accessible locations.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
71. Cylinders are not cross-connected with plant air lines.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
72. Flash arrestors or reverse flow check valves are installed on all flammable gas cylinders.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<b>USAGE (6.7.6)</b>					
73. Eye protection (safety glasses or goggles) is worn when using cylinders.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
74. Cylinder valve and regulator are inspected for foreign material before connecting.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
75. If cylinders are frozen, warm (not boiling) water is used to thaw cylinders.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
76. Cylinder valve remains closed except when the cylinder is in use.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
77. Fuel gas cylinder valves are not opened more than 1½ turns, for quick closing.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
78. If a special wrench is used to open a cylinder valve, it is left in position on the valve.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

<b>SECTION 1 (continued)</b>		<b>Yes</b>	<b>No</b>	<b>N/A</b>	<b>N/O</b>
<b>USAGE (continued) (6.7.6)</b>					
79. Acetylene cylinders are used in the vertical position.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
80. Acetylene cylinders are not used > 15 psig or > 30 psia.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
81. Copper pipe or fittings are not used with acetylene systems.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
82. Compressed gas is not used to dust off clothing.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
83. Cylinder valve closed and regulator relieved of internal pressure before regulators are removed.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<b>EXPLOSIVES (6.8)</b>					
84. Written authorization provided by Munitions Market Segment Leader designating individuals who can store or use high explosives under the authority of the CH2M HILL BATF Type 33 User of High Explosives License/permit.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
85. Written authorization provided by Munitions Market Segment Leader designating individuals who can manufacture high explosives under the authority of the CH2M HILL BATF Type 20 Manufacturer of High Explosives License/permit.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
86. Approved Explosive Siting Plan (ESP).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
87. Approved Explosive Management Plan (EMP).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
88. Sources of ignition are not brought in or near storage magazines, or within 50' of an area where explosives are being handled, transported, or used.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
89. Radio transmitting or receiving equipment is not brought within 1,000' of blasting activities.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
90. Transportation and storage of explosives comply with local, state, and federal regulations.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
91. Vehicles transporting explosives are placarded and displayed according to DOT regulations.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
92. Detonators or blasting caps are not stored with explosive charges.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
93. Explosives are stored in storage magazines as required by local, state, and federal regulations.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
94. Contact the Munitions Response market Segment Leader for additional instructions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<b>PROCEDURES FOR HAZARDOUS MATERIALS SHIPPING (7.0)</b>					
1. Only dangerous goods shippers are permitted to ship dangerous goods (CH2M HILL only).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
2. Dangerous goods are shipped or transported in accordance with CH2M HILL's procedures.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
3. All personnel shipping dangerous goods have completed the computer-based training (CH2M HILL only)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
4. Dangerous goods are stored only in the equipment warehouse prior to shipping.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
5. Written authorization provided by Munitions Market Segment Leader designating individuals who can "offer explosives for shipment" under the authority of the CH2M HILL Department of Transportation Hazardous Materials Certificate of Registration	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<b>SHIPPING BY AIR (7.1)</b>					
5. Shipments for Federal Express meet IATA requirements for dangerous goods.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
6. Before shipping, packages are clearly identified, packed, marked, labeled, and documented.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
7. The quantity does not exceed IATA regulations.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
8. Packaging meets IATA requirements and withstand transport by air.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
9. Shipper classifies each item into one of the 9 hazard classes.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
10. Inner packages are packed to prevent breaking or leaking during shipping.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
11. Absorbent or cushioning material does not react with the contents of the inner package.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
12. Outer packages in fiberboard, a plastic case, or other sturdy container.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
13. Package is capable of withstanding 4' drop test with no damage.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
14. Package is marked with: proper shipping name of contents, technical name, UN number, total net. quantity, and the name and address of the shipper and recipient.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
15. Irrelevant labels have been removed from package.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
16. Hazard label and handling label are secured in correct locations.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
17. Dangerous goods airbill has been completed.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

18. Dangerous goods are not shipped via UPS.

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
--------------------------	--------------------------	--------------------------	--------------------------

**SECTION 1 (continued)**

**SHIPPING BY HIGHWAY (7.2)**

19. Use Federal Express packaging and paperwork requirements that comply with DOT regs for ground transportation of dangerous goods.
20. Consult with local state highway police if route includes vehicular tunnels.
21. Inner packaging prevents breakage or leakage under normal conditions of transport.
22. Absorbent/cushioning material does not react with contents of the package.
23. Labels for highway transportation are the same as those for air transportation.
24. Engine turned off, brake set during loading and unloading.

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Yes</b>	<b>No</b>	<b>N/A</b>	<b>N/O</b>

**EMERGENCY RESPONSE (7.3)**

25. Appropriate emergency response information available not on the package, within reach of driver.
26. Information includes copy of pages from *Emergency Response Guidebook* for each item.
27. An MSDS for each item must also be included.
28. Emergency response information must also include the information found on the shipping papers.
29. CH2M HILL's 24-hour EMERGENCY RESPONSE TELEPHONE NUMBER, (800) 255-3954, is included, as required.
30. In the event of an accident, keep other individuals, except response workers, from the vicinity.
31. In case of breakage, spillage, or leakage, use means to prevent spreading and contain the spill.
32. Care taken during the handling of cargo to minimize hazards.
33. MSDS is consulted for safe handling procedures.
34. Wash the area of the vehicle where the dangerous goods may have spilled.
35. Consult your supervisor in the event of a spill.
36. Ask your supervisor to call CHEM-TEL of the local HAZMAT unit if the spill poses a danger.

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## SECTION 2

Complete this section for all items checked "No" in Section 1. Deficient items must be corrected in a timely manner.

[illegible]

Auditor: \_\_\_\_\_ Project Manager: \_\_\_\_\_

## Attachment 2: PPE Inspection Checklist

## CH2MHILL

### HS&E Self-Assessment Checklist: PPERSONAL PROTECTIVE EQUIPMENT

Page 1 of 3

This checklist shall be used by CH2M HILL personnel **only** and shall be completed at the frequency specified in the project's HSP/FSI.

This checklist is to be used at locations where CH2M HILL employees are required to wear PPE or are required to perform oversight of a subcontractor using PPE or both.

CH2M HILL staff shall not direct the means and methods of subcontractor use of PPE nor direct the details of corrective actions. The subcontractor must determine how to correct deficiencies and CH2M HILL staff must carefully rely on their expertise. Conditions considered to be imminently dangerous (possibility of serious injury or death) must be corrected immediately or all exposed personnel must be removed from the hazard until corrected.

Project Name: _____	Project No.: _____																								
Location: _____ PM: _____																									
Auditor: _____ Title: _____ Date: _____																									
This specific checklist has been completed to (check only one of the boxes below):																									
<input type="checkbox"/> Evaluate CH2M HILL compliance with its PPE program (SOP HSE-117) <input type="checkbox"/> Evaluate a CH2M HILL subcontractor's compliance with its PPE program Subcontractor's Name: _____																									
Check the appropriate box, as follows:																									
<ul style="list-style-type: none"> <li>• Check "Yes" if an assessment item is complete or correct.</li> <li>• Check "No" if an item is incomplete or deficient. Section 2 must be completed for all items checked "No."</li> <li>• Check "N/A" if an item is not applicable.</li> <li>• Check "N/O" if an item is applicable but was not observed during the assessment.</li> </ul>																									
Numbers in parentheses indicate where a description of this assessment item can be found in Standard of Practice HSE-121.																									
<b>SECTION 1</b> <b>GENERAL</b> 1. Required PPE listed in HSP FSI or AHA. 2. PPE available for use by employees. 3. PPE cleaning supplies available for use. 4. PPE stored appropriately to prevent deformation or distortion. 5. PPE written certification has been completed.	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Yes</th> <th style="text-align: left;">No</th> <th style="text-align: left;">N/A</th> <th style="text-align: left;">N/O</th> </tr> </thead> <tbody> <tr><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td></tr> <tr><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td></tr> <tr><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td></tr> <tr><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td></tr> <tr><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td></tr> </tbody> </table>	Yes	No	N/A	N/O	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Yes	No	N/A	N/O																						
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>																						
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>																						
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>																						
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>																						
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>																						
<b>EYEWEAR (Glasses/Goggles/Face Shields)</b> 6 Eyewear cleaning supplies available. 7 Safety glasses in good condition and lenses free of scratches. 8 Goggles adjustment strap not cracked or frayed, not deformed, or lenses not scratched. 9. Face shields in good condition, including adjustment band, and free of scratches or chips.	<table border="1" style="width: 100%; border-collapse: collapse;"> <tbody> <tr><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td></tr> <tr><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td></tr> <tr><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td></tr> <tr><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td></tr> </tbody> </table>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>								
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>																						
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>																						
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>																						
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>																						

# CH2MHILL

## HS&E Self-Assessment Checklist: PERSONAL PROTECTIVE EQUIPMENT

Page 2 of 3

SECTION 1 (Continued)	Yes	No	N/A	N/O
<b>HEAD PROTECTION</b>				
10. Hard hat bill and suspension attached as allowed by manufacturer.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. Shell is pliable, free of dents, cracks, nicks, or any damage due to impact.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. Suspension maintained at 1.25 inches from inside of shell.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. Suspension free of cuts or fraying, torn headband, adjustment strap workable.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. Electrical hard hat matched to hazard classification.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. Dated to determine whether within manufacturer's allowable 5-year use time period.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>HAND PROTECTION</b>				
16. Available in sizes matched to employee.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. Gloves free of rips tears, abrasions, or holes.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18. Matched to manufacturer's specification for chemicals used onsite.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19. Electrical gloves matched to hazard and periodically inspected for insulating rating.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20. Maintained in a clean and sanitary condition, decontaminated or disposed properly.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>BODY PROTECTION</b>				
21. Available in sizes matched to employee.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22. Maintained in a clean and sanitary condition, decontaminated or disposed properly.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
23. Vapor-tight fully encapsulated suits tested at required periodic intervals.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
24. Flame-resistant clothing matched to electrical hazard and arc flash rating.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25. Welding gear matched to degree of hazard and free of cuts, tears or burn holes.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
26. Flotation gear available for work near or on water and in good condition.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>HOT AND COLD BODY PROTECTION</b>				
27. Cooling gear available based on degree of heat stress hazard.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
28. Cooling gear in operable, clean, and sanitary condition.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
29. Cold-weather gear provided based on needs assessment.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
30. Cold-weather gear available in sizes to match employees.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
31. Cold-weather gear is in free of tears, rips, or holes and in maintained in a clean condition.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>TRAINING</b>				
32. Initial PPE training completed by employees.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
33. Training conducted when new types or styles of PPE are issued.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
34. PPE selection, use, and maintenance reviewed at daily safety briefings.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Complete this section for all items checked “No” in Section 1. Deficient items must be corrected in a timely manner.

[illegible]

Auditor: \_\_\_\_\_ Project Manager: \_\_\_\_\_

## Appendix D

### Standard Operating Procedures

---

<p align="center"><b>MRP—SOP—0001</b></p> <p align="center"><b>MUNITIONS RESPONSE PROGRAM (MRP)</b></p> <p align="center"><b>STANDARD OPERATING PROCEDURE (SOP)</b></p> <p align="center"><b>SURFACE MUNITIONS AND EXPLOSIVES OF CONCERN (MEC)</b></p> <p align="center"><b>&amp; SUBSURFACE ANOMALY AVOIDANCE</b></p>
<p align="center"><b>1.0 OBJECTIVE:</b></p> <p>Provide safe procedures to avoid Munitions and Explosives of Concern (MEC) during visitor/personnel escort, land survey, vegetation reduction, sediment sampling, soil boring, drilling, direct push technology-core sampling, or other environmental or construction activities conducted in an environment where the presence of MEC is suspected.</p>
<p align="center"><b>2.0 PURPOSE:</b></p> <p>This SOP provides guidance for avoiding surface MEC (e.g., Unexploded Ordnance (UXO), Discarded Military Munitions (DMM)), Material Potentially Presenting an Explosive Hazard (MPPEH), and subsurface anomalies.</p>
<p align="center"><b>3.0 APPLICABILITY:</b></p> <p>This SOP applies MEC avoidance procedures per Department of Army Engineering Pamphlet (EP) 75-1-2 Munitions and Explosives of Concern Support During Hazardous Toxic and Radioactive Waste (HTRW) and Construction Activities.</p>
<p align="center"><b>4.0 TECHNICAL GUIDANCE:</b></p> <p><b>This SOP lists processes and procedures that comply with the following sources:</b></p> <ul style="list-style-type: none"> <li>➤ DOD 6055.09-M, Ammunition and Explosives Safety Standards, February 2008</li> <li>➤ USN Environmental Restoration Program (MRP Chapter 12) August 2006</li> <li>➤ NAVSEA OP 5 Volume 1, Ammunition and Explosives Safety Ashore, July 2009;</li> <li>➤ NOSSA Instruction 8023.11(series), Standard Operating Procedure Development</li> <li>➤ USAF Manual 91-201, Explosive Safety Standards, November 2008</li> <li>➤ DA Pamphlet 385-64, Ammunition and Explosives Safety Standards, October, 8, 2008</li> <li>➤ DA Field Manual (FM) 21-16, Unexploded Ordnance (UXO) Procedures, August, 1994</li> <li>➤ DA Engineering Manual (EM) 1110-1-4009, Military Munitions Response Actions, June, 2007</li> <li>➤ DA Engineering Pamphlet (EP) 1110-1-18, Military Munitions Response Process, April 2006</li> <li>➤ DA Engineering Manual (EM) 385-1-97, Explosives, Health and Safety, September 2008</li> <li>➤ <b>Note: Electronic copies for the sources listed above are available via CH2M HILL SUXOS Laptop Computer</b></li> </ul>

### 5.0 SOP VALIDATION RECORD:

SOP Title: MEC Anomaly Avoidance ..... Work Instruction Identification/  
SOP: # MRP-SOP-0001

Author: K. Lombardo Date: December 1, 2009 ..... Revision Date: 02/16/2012

Review: G. DeMetropolis, Date: February 16, 2012 ..... Approval; J. Bowles

Validation Date: December 14, 2009 ..... Process Observer: Kevin Lombardo,  
December 14, 2009

### 6.0 HAZARDOUS MATERIALS:

Hazardous Chemicals: None; Product Name: N/A; Material Safety Data Sheets: N/A; Health Hazards: N/A

### 7.0 EMERGENCY RESPONSE INFORMATION

**Work Site Name (location) address/building # Street):**

\_\_\_\_\_

**Nearest intersection (cross streets) or entrance gate:**

\_\_\_\_\_

**Safe Area Rally Point (gate/building or intersection) Note: Rally Point should be upwind of work location:**

\_\_\_\_\_

**UXO Qualified Technician Incident Commander: (name) \_\_\_\_\_**

#### **Personnel Injury or Medical Distress:**

1. Summon Emergency Medical Services (EMS)
2. Administer First Aid and/or CPR
3. Notify Project Manager
4. PM implements CH2M HILL SOP 111, Incident Notification, Reporting, and Investigations.

#### **Fire:**

1. Evacuate personnel from the Munitions Response Site and Area to safe rally point
2. Notify Fire Department of "Work site Name," fire location, and personnel safe rally point
3. Obtain head count, ensuring all personnel are present and or accounted for.
4. Notify Project Manager
5. PM implements CH2M HILL SOP 111, Incident Notification, Reporting, and Investigations.

(Fire/Rescue radio call sign ): \_\_\_\_\_ Phone # \_\_\_\_\_

Medical Services radio call sign: \_\_\_\_\_ Phone # \_\_\_\_\_

Range Control radio call sign: \_\_\_\_\_ Phone # \_\_\_\_\_

Project Manager POC: \_\_\_\_\_ Phone # \_\_\_\_\_

Identify local disaster warning system (radio, PA, phone, other): \_\_\_\_\_

Flag(s): \_\_\_\_\_

Warning Bells/Horns/Sirens/Lights/Strobes: \_\_\_\_\_

Public Address System: \_\_\_\_\_

Weather Radio Channel: \_\_\_\_\_

Other: \_\_\_\_\_

## 8.0 PERSONNEL ROLES AND RESPONSIBILITY

**Note:** Roles and responsibilities are dependent upon work plan direction; one or all roles and responsibilities may be applicable.

1. Project/Construction Manager (P/CM): Provides the necessary resources and personnel to safely and efficiently accomplish the scope of work. Ensures CH2M HILL unexploded ordnance (UXO) personnel shall be qualified in accordance with:
  - OPNAVINST 8020.14/MCO P8020.11 (series).
  - And are certified to perform the job assigned and that the certification is current. Contractors who perform those duties described in NAVSEA OP5, paragraph 2-3 involving ammunition and explosives shall comply with NAVMED P117 Article 15-107.
  - Prior to site operations, CH2M HILL will verify training, medical qualification statements by physicians, and conformance to substance abuse testing and reporting programs.
  - Shall confirm active explosive certification program conformance for personnel compliance to requirements for UXO personnel identified IAW DDESB Technical Paper (TP) 18, and monitors these personnel for conformance to the Bureau of Alcohol, Tobacco, Firearms, and Explosives, Safe Explosives Act 2003 Certification requirements for "Employee Possessor," and or "Responsible Person."
2. Senior UXO Supervisors or Unexploded Ordnance Technician III or II: Supervises the operational resources necessary to implement, and accomplish this procedure and requirements set forth within the Work, Health, Safety, Quality and Accident Prevention Plans. May stop work at anytime to prevent accidents, remedy unsafe conditions, stop an unsafe act, or question the safety of a process or procedure or observe nonconformance to this SOP and/or plans. Provides a Site Specific Tailgate Safety Briefing to include MEC, construction, industrial, environmental, and natural safety hazard awareness. Provides the plan of day. As applicable provides a Hazardous Materials briefing for items used, consumed, or required for this SOP. Brief

<p>personnel on communications, security, emergency/medical response, evacuation, rally points, IAW with project instructors, and plans. Also, informs personnel to prevent disclosure of classified work, site observations, or information.</p> <p>3. Non-UXO Qualified Personnel are obligated to follow guidance within this SOP, Work, Health and Safety and Accident Prevention Plans.</p>	
<b>9.0 PRE-OPERATIONAL CHECK LIST</b>	
1. ( ) CH2M HILL Inc. Safety Risk Evaluation (SRE) and Explosives Safety Submission Determination (ESSD) (Navy Projects)	2. ( ) Project Task/Work/ Instructions
3. ( ) Work Plan/Accident Prevention Plan/ Health and Safety Plan	4. ( ) Personal Protective Equipment (PPE) IAW Safety Plan
5. ( ) Emergency P.O.C List	6. ( ) Directions and map to hospital
7. ( ) Communications (2 methods)	8. ( ) First aid/Fire Extinguisher/- (GPS/compasses optional)
<b>10.0 ANOMALY DETECTION EQUIPMENT (as required by project instruction)</b>	
( ) Ferrous Metal Detector (Schonstedt GA 52CX or Ferex 4.021 MK 26 Mod 0 or equivalent), with extra batteries, carry case, & instruction manual (as required by project instructions)	
( ) All Metals Detector (White Spectrum XLT or equivalent) with extra battery, carry case, & instruction manual (as required by project instructions)	
( ) Down-hole Instrument Direct Push Technology – Schonstedt MG 230 Gradiometer maximum 2.12-inch "Outside Diameter" (OD) Probe Head - Extra batteries and instruction manual (as required by project instructions)	
<b>11.0 EXPLOSIVE ORDNANCE RECONNAISSANCE EQUIPMENT</b>	
<b>WARNING</b>	
<b>Direct physical contact with or movement of MEC or MPPEH is not authorized.</b>	
( ) Tape Measure, ruler, pen/paper, item for scale perspective (e.g. dollar bill),	
( ) Camera (digital), with spare batteries (as required by project instructions)	
( ) Small dry erase white board and dry erase marker for photograph item number, date, time, location, and description.	

12.0 GENERAL INFORMATION	
<b>CATEGORY</b> Surface MEC/Anomaly Avoidance	<b>DIRECTIONS</b> (S) = Safety, (O) = Operations, (Q) = Quality Control
<p><b>Note: (o)</b> PM shall obtain MISS Utilities Check and or local Dig (intrusive) permits prior to intrusive actions (such as use of direct push technology, drilling, and use of hand augers)</p> <p><b>(WARNING)</b></p> <p><b>Fire: (s)</b> Do not attempt to fight a fire, evacuate area, move upwind or crosswind to safe rally point, notify fire department.</p> <p><b>Wildlife: (s)</b> Aggressive/defensive – Avoid wildlife –withdraw from area</p> <p><b>Hunters: (s)</b> Withdraw from area, retreat to vehicle, contact project authority</p> <p><b>CWM: (s)</b> Evacuate upwind to safe rally point, mark area on map, contact PM</p> <p><b>Severe Weather (lighting, winds, and storms): (s)</b> Evacuate to vehicle, follow PM guidance</p>	
13.0 SAFETY	
<b>Munitions Response Group Safety Manager</b>	George DeMetropolis/SDO  Telephone (Office): (619) 687 – 0120, Ext. 37239  Telephone (Cellular): (619) 564 – 9627
<b>Safety Plan, Accident Prevention Plan and Activity Hazard Analysis</b>	(s) All field personnel require reading, compliance, and acknowledging they understand and comprehend the safety information contained within these plans, SOP and AHA; attesting through signature and date
<b>Visitors access to work location</b>	(s) All visitors (contract/transient/witness) require a safety briefing, wearing of PPE IAW site specific safety plan, and conformance to UXO Technician instructions.
<b>Safety Meeting:</b>	(s) Each morning – Project Personnel shall participate in a tailgate safety briefing, discussing the operational activities (plan of the day), MEC/HTRW hazards/risks, safety controls, and emergency procedures; daily weather forecast, work activity OSHA PPE level, insect/poisonous plant avoidance, and heat/cold stress prevention. Personnel shall sign and date, the safety briefing acknowledgment form; confirming individual participation, understanding, and comprehension prior to operations. Personnel who do not participate in the safety briefing or, understand, or comprehend the safety briefing may not access work areas.

<p><b>Safety Pre-field operations check list</b></p>	<p>(s) (   ) First Aid Kit (serviceable and supplies within shelf life)</p> <p>(s) (   ) Fire Extinguisher 10BC (or greater) (charged/indicator green)</p> <p>(s) (   ) Water (minimum 1 liter per person)</p> <p>(s) (   ) Cell phone/identified alternate land line location/or two-way Radio</p> <p>(s) (   ) Identification of wind direction, and rally points</p> <p>(s) (   ) PPE IAW Activity Hazard Analysis</p> <p>(s) (   ) Vehicles unlocked; keys in announced location</p> <p>(s) (   ) Insect repellent/sun screen (available)</p>
<p><b>Equipment Check-out:</b></p> <ol style="list-style-type: none"> <li>1) Schonstedt – GA52CX magnetometer or equivalent</li> <li>2) White’s (E series) Spectrum model XLT Metal Detector or equivalent</li> <li>3) Schonstedt gradiometer MG 230 for Down-hole or underwater search or equivalent</li> <li>4) Forster Ferex 4.021 models K,L, &amp; W or MK 26 MOD 0 magnetometer for down-hole or underwater search or equivalent</li> </ol>	<p>(o) Assemble/inspect, IAW manufacture instructions</p> <p>(o) Test geophysical instruments against a known source (ferrous or non-ferrous) for instrument response.</p> <p>(o) Source (ferrous) Schedule 40, 2-inch x 5-inch steel pipe or equivalent</p> <p>(q) Pass/Fail - instrument shall detect source on surface at 12-inches above item/fail non-detect - replace instrument</p> <p>(o) Source on surface (non-ferrous) ¾-inch x 6-inch Brass Pipe nipple (aka) couple fitting or equivalent</p> <p>(q) Pass/Fail - instrument shall detect source on surface at 6-inches above item/fail non-detect - replace instrument</p> <p>(q) Name of individual recording geophysical instrument source test results by instrument manufacturer with: type, model, serial number, by the date of daily equipment check. Record results for pass/fail source test with remarks. Reject and replace geophysical instrument that does not pass quality control source test.</p>



14.0 SITE ACCESS	
<p><b>WARNING:</b></p> <p>UXO Technician(s) shall not make physical contact with MEC, or commercial explosives. UXO Technicians assigned to implement this SOP shall not intentionally move MEC or explosives, incendiaries, smokes, propellants, or commercial explosives.</p> <p><b>NOTE:</b></p> <p>If MEC, to include Unexploded Ordnance (UXO), Discarded Military Munitions, (DMM) or Material Potentially Presenting an Explosive Hazard (MPPEH) are encountered, the UXO Technician shall respond IAW 3R training, avoid such items, and notify Project Manager IAW site-specific project instructions.</p>	<ul style="list-style-type: none"> <li>(o) Implement 3R (R, R, R) process, and procedures.</li> <li>(o) Recognize MEC, UXO, DMM, and or MPPEH; offset mark anomaly location with flag, ribbon, paint, stakes, other location identifier</li> <li>(o) Retreat from MEC location and avoid MEC location</li> <li>(o) Report &amp; record MEC location in logbook and contact Project Manager IAW project instructions to request additional guidance.</li> </ul> <p><b>Note:</b></p> <p>MR Safety may instruct UXO Qualified Technician to perform a zero contact Explosive Ordnance Reconnaissance of the item requesting information for type by function, condition, filler, and nomenclature (if visually possible), supported by photographs of the item.</p>
15.0 EXPLOSIVE ORDNANCE RECONNAISSANCE (EOR)	
<p><b>EXPLOSIVE ORDNANCE RECONNAISSANCE</b></p> <p>Reconnaissance involving the investigation, detection, location, marking, initial identification, and reporting of suspected MPPEH in order to determine future action</p>	
<p><b>EOR Method</b></p> <p>UXO Qualified Technician is required prior to performing an Explosive Ordnance Reconnaissance to review Department of the Army, Field Manual (FM) 21-16, Unexploded Ordnance (UXO) Procedures, August 1994 – A copy can be obtained from:</p> <p><a href="http://WWW.UXOINFO.COM">WWW.UXOINFO.COM</a> or from CH2M HILL MR Operations, Kevin Lombardo/WDC</p>	<ul style="list-style-type: none"> <li>(o) Use general Explosive Ordnance Disposal (EOD) safety precautions until munition type, fuzing, condition, and filler are identified</li> <li>(o) Upon identification, of type by function, fuzing, and condition use general EOD safety precautions for the category of munition (e.g. Rocket; avoid approach to the front and rear of item, etc.).</li> <li>(s) Approach Unexploded Ordnance (UXO) 45° to the rear</li> <li>(s) Do not cast shadows over UXO fuze</li> <li>(s) Remain cognizant to avoid dispensed wires, filaments, or other items that could initiate movement</li> <li>(s) Remain cognizant of Electromagnetic Hazardous Radiation, to Ordnance (HERO) precautions.</li> </ul>

<p><b>Information Recovery</b></p>	<p>(o) Photograph item from each vantage point. Identify each photograph with item name, view (side, front, rear, etc.), and distance from camera to item, (f-stop &amp; shutter speed and film speed if applicable). It is required that a photograph log be kept for each item. Use a ruler in photo to demonstrate perspective of the item.</p> <p>(o) Close-up photograph fuze, markings, nose, tail, and or markings</p>
<p><b>16.0 PERSONNEL ESCORT</b></p>	
<p><b>Personnel Escort</b></p> <p>A minimum of one UXO qualified Technician(II) shall escort non-UXO qualified site personnel conducting access to a Munitions Response Area or Site</p> <p>The UXO qualified person shall visually search the surface of walking paths, roads, and parking areas to locate, mark, and avoid MEC during walking, driving, or setting-up equipment.</p>	<p>(o) Establish a wind streamer of tape/ribbon (flag) within/near the project site to observe wind direction.</p> <p>(o) A UXO Technician shall visually search the surface area, for MEC/HTRW to avoid such items. The UXO Technician may augment the visual search with the application of a geophysical instrument to detect surface/ subsurface ferrous and or non-ferrous anomaly sources for the purpose of anomaly avoidance</p> <p>(o/s) When escorting non-qualified UXO personnel, a UXO Technician shall lead, and non-UXO qualified personnel shall follow along a path identified by the UXO Technician.</p> <p>(o) The UXO Technician shall identify surface hazards (MPPEH) and avoid such hazards. The location of a hazard requires, the UXO Technician to communicate the location to non-UXO qualified persons for avoidance around the item.</p> <p>(s) Communication can be by hand signals (pointing), or marking with flags, tape, ribbon, paint, stakes, or other means identified during a safety briefing.</p> <p>(s) Essential Personnel Limits - MR Escorts are a minimum of one UXO qualified Technician II or above, to no more than six (6) non-qualified persons.</p> <p>(s) Non UXO qualified personnel shall not approach and avoid a marked MPPEH or HTRW hazard.</p>

<b>17.0 MEC AVOIDANCE SUPPORT</b> <b>LAND SURVEY, SEDIMENT SAMPLING, GROUNDWATER COLLECTION, ENDANGERED SPECIES SAMPLING/MONITORING</b>	
Applicable to Visitors, Land Survey, Sediment Sampling, Groundwater Collection, Endangered Species Sampling/Monitoring	
<b>WARNING:</b>  Subsurface intrusive acts could initiate MEC, through physical contact, movement, or shock.	<p>(o) A UXO Technician shall search each intrusive point from the surface with a magnetometer and or all metals detector in accordance with the instruments manufactures instructions, to locate ferrous and/or non-ferrous subsurface anomalies. Location of such subsurface anomalies requires the placement of an offset marker (pin flag a minimum of 12-inches) to the north of the greatest signal strength for the anomaly.</p> <p>(s) For land survey and sampling activities where detection of an anomaly occurs, an alternative location free of ferrous and non-ferrous anomalies is required to proceed with intrusive activities.</p> <p>(q) The UXO Technician shall note within the daily logbook the rejection of the primary location and selection of the alternative location, with a written description of direction and feet/inches for the offset location from the primary point.</p>
<b>NOTE:</b>  Personnel performing subsurface intrusive activities for the purpose of land survey and environmental sampling require a UXO Technician to search the subsurface with either or both (dependent on MEC site-specific history) a magnetometer and/or all metals detector to confirm the subsurface is free of ferrous and or non-ferrous anomalies.  A UXO Technician shall mark the boundaries /limits for ingress/egress access from a safe area (i.e.: road) to the work activity location or provide escort to and from the work activity location.	
<b>18.0 VEGETATION REDUCTION MEC AVOIDANCE (MANUAL/MECHANICAL)</b>	
<b>WARNING:</b>  DO not apply vegetation cutting closer than six-inches to ground surface.  Vegetation reduction actions that occur less than six-inches above ground surface, may result in movement, or shock to MEC, resulting in an unintentional detonation or functioning as designed of the item.	<p>(o) A UXO Technician shall escort vegetation reduction personnel, perform a visual and/or magnetometer and/or all metals detection instrument search of surface access routes, walking paths, and vegetation reduction locations for MEC/HTRW and or obstruction hazards.</p> <p>(o) The UXO Technician shall operate a magnetometer and or all metals detection instrument to locate surface anomalies with potential to be a hazard to vegetation reduction crews.</p> <p>(o) The UXO Technician shall perform a visual surveillance of the surface to locate surface hazards (MEC, HTRW) or obstructions to equipment, mark the location and instruct vegetation reduction crews to avoid the location.</p>

	<p>(s) The UXO Technician shall remain away from the immediate operating radius of powered equipment and remain alert for flying debris</p> <p>(s) The UXO Technician shall wear high visibility outerwear, use hearing, and eye protection, and avoid swing radius of powered equipment.</p>
<p><b>Warning :</b></p> <p>Personnel performing vegetation reduction activities shall not operate equipment closer than 6-inches to the ground thus, all brush cutting equipment (chain saws, weed whackers, string trimmers, brush cutters, bush hogs, hydro-ax, or debarking equipment) shall operate six-inches or greater above ground.</p>	
<p style="text-align: center;"><b>19.0 MEC AVOIDANCE (DOWN HOLE)</b></p>	
<p><b>WARNING:</b></p> <p>When applying MEC avoidance procedures for drilling or the use of direct push technology, the steel mass of drill rigs and direct push technology DPT power plants will influence gradiometers, and magnetometer reporting instruments. Thus, drill rigs and DPT equipment shall be withdrawn a minimum of ten feet from intrusive points while performing down-hole avoidance search.</p>	<p>(o) Prior to drilling, the UXO Technician will conduct a visual reconnaissance of access paths and drilling area. The reconnaissance will include locating the designated sampling or drilling location(s) ensuring that the locations do not have surface MEC, or MPPEH, and magnetometers or all metal detection search do not indicate the presence of subsurface anomalies. If detection of subsurface anomalies occurs, at the sampling point, the sampling point is abandoned. Once the designated sampling point has been determined free of anomalies, an access route for the sampling crew's vehicles is searched. The access path requires twice the width of the widest vehicle and marking along the sides with flags, ribbon, engineer tape, stakes, or equivalent to define limits.</p> <p>(s) If an observation of MEC or MPPEH should occur, the UXO Technician shall mark the item, avoid it, and notify the PM for either military EOD or UXO Contractor support.</p> <p>(o) A UXO Technician will clear each work site for drilling/DPT and clearly mark the safe to walk, and drill or DPT, boundaries. Each drill/DPT safe area will be large enough to accommodate the drilling equipment and provide a work area for the crews. As a minimum, the safe area will be a rectangle, with a side dimension equal to twice the length of the largest vehicle or piece of equipment for use on site.</p>
<p><b>NOTE:</b></p> <p>(p) Drilling and application of DPT may require an ingress route and pad turning radius, twice the width, and length of the mechanical equipment.</p>	
<p><b>NOTE:</b></p> <p>MEC may exist within the subsurface up to 30 feet below ground surface, dependent on site-specific history. Refer to project instruction to determine maximum depth for down-hole MEC avoidance support.</p>	

The UXO Technician is required to escort personnel and remain with personnel when sampling/drilling at an MRP or MEC/MPPEH suspect site.	(o) Soil bore holing may be by hand auger, power-auger, drilling, DPT. A UXO Technician will examine, prior to sampling/drilling, the borehole location with a down-hole gradiometer or magnetometer, a minimum of every one (1) foot, to the deepest sampling depth or a maximum of 30 feet below ground surface to ensure avoidance of anomalies, or to depth identified within the project instruction.
<b>WARNING:</b> Drilling equipment may produce injury from snapping cables, pinch points, chain failures or falling booms, derricks, and drill piping. Avoid the immediate operational radius of drillers when supporting efforts.	(o) Drilling down-hole monitoring requires at a minimum of one (1) foot increments of search, during the actual well drilling operation. This will require the withdrawal of the drill rod or augers from the hole and moving the drill rig a minimum of 10 feet or enough feet away from the drill-hole location to prevent the metal in the rig from influencing the magnetometer/gradiometer.  (o) The UXO Technician shall perform down-hole monitoring for anomalies at each location identified within the project instruction.
<b>20.0 QUALITY CONTROL</b>	
The QC Manager will be responsible for ensuring this SOP is effectively implemented. Surveillances and/or inspections will be conducted to ensure SOP compliance.	(q) UXOQC personnel shall document nonconforming materials, items or activities in a NCR based on surveillances and/or inspections
<b>21.0 ACTIVITY COMPLETION</b>	
<b>Completion of documentation:</b>	( ) Project site logs to Project Manager ( ) Tail gate safety meeting log to Project Manager ( ) Equipment check-out report to Project Manager ( ) Quality control reports to Project Manager
<b>21.0 EQUIPMENT</b>	
<b>ITEM</b>	<b>QUANTITY</b>
Cellular telephone	1
Dow-hole (only) Magnetometer/Gradiometer capable of down-hole operations to 30 feet	1 or (as required by Project instruction)
Magnetometer capable of monitoring to a depth of two-feet below ground surface for ferrous items	1 or (as required by Project instruction)
All metals detector capable of monitoring to a depth of 6-inches below ground surface for non-ferrous items	Optional

Multi colors of marking flags, ribbon, and tape	As determined by SUXOS
Batteries	Two day supply for instruments
First –aid Kit (25 person)	1 within the work area
Water	Minimum 1 liter per person in work area
Camera/Tape Measure/Ruler/Calipers/Paper Pencil	As determined by SUXOS
Hand tools, (hammer, general purpose tools, etc.)	Assorted as determined by SUXOS
<b>MINIMUM PERSONAL PROTECTIVE EQUIPMENT: IAW with Safety Plan and AHA or a minimum of OSHA LEVEL “D”</b> Coveralls (or long pants, sleeved shirt) Boots (level “D”) Cover (cap, floppy, skull) Gloves (leather) Safety Eye protection (as required by AHA) Hard hats (when working in an area with a potential for head injury or heavy equipment e.g. drill rig) Because this is a possible HTRW operation, the MR Supervisor will direct the required explosive safety site PPE conditions.	
<b>SPECIAL TRAINING AND REFRESHER REQUIREMENTS:</b> UXO Technicians will be qualified at a minimum Level II designation and be graduates of the U.S. Naval School of Explosive Ordnance Disposal or other DOD DEDSB TP 18 approved course or school/course of instruction, Hazard Waste Operations IAW 29CFR 1910.120 (e) & (f) and medical clearance physical authorization to perform work.	
<b>WAIVERS, EXEMPTIONS, SPECIFIC AUTHORIZATIONS, OR APPROVED DEVIATIONS THAT APPLY TO THIS OPERATION:</b> None	
<b>ACTIVITY HAZARD ANALYSIS</b>	

## Safe Work Method Statement/ Job Hazard Analysis

Company Name: <b>CH2M HILL</b>		Project Name/#: SOP MRP 0001- MEC Anomaly Avoidance
Work Activity/Task: MEC Anomaly Avoidance		Principal Contractor: <b>CH2M HILL</b>
Date: December 09, 2009		Note: Sign off to be provided at Tool Box talk
Prepared by: George DeMetropolis		Supervisor: TBD by project location
Signature:		Safety Coordinator (SC): TBD by project location
All metals detection equipment, metal detection instruments, magnetometry equipment, gradiometers, and military ordnance detection equipment, plant & equipment required: - machinery: maintenance checks provided and recorded by subcontractor or operator: suitably qualified and competent, with health, safety, and environment (HS&E) training		<p>Training Requirements 29 CFR 1910.120 (e) &amp; (f); DDESB TP 18 minimum qualifications for Unexploded Ordnance Technicians; OPNAVINST 8020.14/MCO P8020.11 (series) and are certified to perform the job assigned and certification is current. NAVSEA OP5, paragraph 2-3 involving ammunition and explosives shall comply with NAVMED P117 Article 15-107. Prior to site operations, CH2M HILL will verify training, medical qualification statements by physicians, and conformance to substance abuse testing and reporting programs. CH2M HILL has an active explosive certification program and monitors these personnel for conformance to the Bureau of Alcohol, Tobacco, Firearms, and Explosives, Safe Explosives Act 2003 Certification requirements for "Employee Possessor," and or "Responsible Person." 3R training for non-UXO qualified Personnel.</p> <p>(in addition to those in project's written safety plan: - OHS Construction Induction - Waste Management for waste streams and materials</p>
Job Step	Potential Hazard	Controls
Forms/Permits	Unknown client-specific hazards. MEC Surface/Subsurface	<p>UXO qualified personnel, SOP MR 0001, 3Rs Training for Non-UXO qualified personnel, Metal (ferrous/nonferrous) detection equipment, DA EP 75-1-2.</p> <p>Well driller license, drill rig permit •Well installation or abandonment notification</p> <p>•Dig/drill permit obtained, where required by client facility •Water withdrawal permit obtained, where required</p>
Site Setup	Striking underground utilities, impact with MEC	<p>•Location of underground utilities and installations identified •Daily briefing</p> <p>Avoid Surface and Subsurface MEC through the use of MR SOP 0001 – MEC Anomaly Avoidance</p>
	Striking overhead utilities	<p>•Locate and take appropriate precautions with required distances from power lines</p> <p>•Lower mast and secure during travel</p>
	Physical environmental hazards	<p>•Use of appropriate personal protective equipment (PPE) where required. Safety boots, hard hats, safety glasses and hearing protection are mandatory. Respirators when chemical hazards exist. No loose-fitting clothing, rings, watches, etc.; long hair to be restrained close to the head.</p>
	Dermal or inhalation exposure to contaminants	<p>•Investigate history of area; determine nature and degree of contaminants that could be present •Conduct air monitoring for potential hazardous atmospheres as described in the project's written safety plan. •Use respirators and other PPE as prescribed in the project's written safety plan</p>

Job Step	Potential Hazard	Controls
Site Setup (Continued)	Fire /Explosion	• No smoking around the drill rig – MR SOP-0001 MEC Anomaly Avoidance
	Struck by vehicles	•Follow traffic control plan •Wear high-visibility warning vests
	Drill rig travel	•Ensure stable ground and adequate footing for machinery. Adequate ground preparation to support loads and accommodate waste materials. •Drill rig travel will be conducted with mast secured in its lowered position •Tools and equipment secured prior to rig movement •Only personnel seated in cab are to ride on the rig vehicle •Ensure clearance of overhead power lines •Use alarm or spotter when reversing rig
	Illegal offsite impacts	• Excavation area checked for wetlands, endangered species, cultural/historic resources
	Spread of contamination from contaminated drill cuttings	•Manage cuttings in accordance with all project plans
Drilling Activities	Rotating machinery parts of drill rig  MEC- surface/Subsurface – physical contact	<p>•Daily inspection of drill rig &amp; equipment •Ensure appropriate guards are installed or suitable barriers to forewarn personnel of dangers •Personnel clear during set up, clear of rotating parts •Loose clothing, long hair, and jewelry to be safely secured •Hands or feet should not be used to move cuttings away from auger •Rig in neutral and augers stopped rotating before cleaning •Kill switch installed, clearly identified and operational •Rig placed in neutral when operator not at controls •Pressurized lines and hoses secured from whipping hazards</p> <p>Advance Drill/bore hole/DPT in one foot increments applying MR SOP 0001- MEC Anomaly Avoidance Procedures</p>
	Hoisting operations	•Ensure all personnel are clear of operation to a suitable safe distance
	Overturning of drill rig	•Establish drill pad if necessary •Drill rig level and stabilized
	Securing ropes and cables	•Ensure security to stable fixture. Do not wrap around any part of the body. •Drill rig ropes in clean, sound condition



## 22.0 PROCESS SUPERVISOR'S STATEMENT

I have read and understand this SOP. To the best of my knowledge, the processes described within this SOP can be done in a safe, healthful, and environmentally sound manner. I have made sure that all persons assigned to this process are qualified, have read and understand the requirements of this SOP, and have signed the workers statement for this process. I will ensure the SOP is the most recent revision. If a major change to the SOP is necessary, I will ensure that the processes are stopped until the SOP is revised and approved. If unexpected safety, health, or environmental hazards arise, I will stop activities, until hazards have been controlled, reduced, or eliminated to an acceptable risk level.

### SOP MRP 0001 PROCEDURE SUPERVISOR ACKNOWLEDGEMENT

UXO Supervisor's Name (print):	Supervisor's Signature	Organization	Date

### 23.0 PERSONNEL STATEMENT

I have read this SOP and I have received adequate demonstration of the procedure, training to perform the process and procedure according to requirements, procedure, and guidance identified below. I agree to follow this SOP, unless I identify a hazard, work condition, or compliance issue not addressed within this SOP or encounter a situation, condition, or issue that, I cannot perform according to the SOP. If such a stoppage occurs, I will immediately notify the SUXOS, UXO Technician III, or II. Should the situation, condition, or compliance remain unresolved for greater than 24-hours, I shall contact the Munitions Response Safety Manager (619) 564-9627.

### SOP MRP – 0001 - PERSONNEL STATEMENT ACKNOWLEDGEMENT

Personnel Name (print):	Personnel Signature	Organization	Date

## Appendix E

### Quality Control Forms

---

# FORM 8-1b

## Preparatory Inspection Checklist (Part I)

Contract No.:

Date: \_\_\_\_\_

TITLE AND NO. OF TECHNICAL SECTION:

---

---

---

---

### A. Planned Attendees:

	Name	Position	<u>Company</u>
1)	_____	_____	_____
2)	_____	_____	_____
3)	_____	_____	_____
4)	_____	_____	_____
5)	_____	_____	_____
6)	_____	_____	_____
7)	_____	_____	_____
8)	_____	_____	_____
9)	_____	_____	_____
10)	_____	_____	_____
11)	_____	_____	_____

### B. Submittals required to begin work:

	Item	<u>Submittal No.</u>	Action Code
1)	_____	_____	_____
2)	_____	_____	_____
3)	_____	_____	_____
4)	_____	_____	_____
5)	_____	_____	_____
6)	_____	_____	_____
7)	_____	_____	_____
8)	_____	_____	_____

I hereby certify, that to the best of my knowledge and belief, that the above required materials delivered to the job site are the same as those submitted and approved.

\_\_\_\_\_  
Contractor Quality Control Systems Manager

FORM 8-1b (Continued)

Preparatory Inspection Checklist  
(Part I)

Contract No.:

Date: \_\_\_\_\_

C. Equipment to be used in executing work:

- 1) \_\_\_\_\_
- 2) \_\_\_\_\_
- 3) \_\_\_\_\_
- 4) \_\_\_\_\_
- 5) \_\_\_\_\_

D. Work areas examined to ascertain that all preliminary work has been completed:

\_\_\_\_\_  
\_\_\_\_\_

E. Methods and procedures for performing Quality Control, including specific testing requirements:

\_\_\_\_\_  
\_\_\_\_\_

The above methods and procedures have been identified from the project plans and will be performed as specified for the Definable Feature of Work.

\_\_\_\_\_  
Contractor Quality Control Systems Manager

## Preparatory Inspection Checklist (Part II)

- 
- This image shows a single sheet of white paper with horizontal blue ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

MEC QCS

---

Technical Representative

# FORM 8-2b

## Initial Phase Check List

Contract No.:

Date: \_\_\_\_\_

Title and No. of Technical Section: \_\_\_\_\_

\_\_\_\_\_

Description and Location of Work Inspected: \_\_\_\_\_

A. Key Personnel Present:

Name	Position	<u>Company</u>
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

B. Materials being used are in strict compliance with the contract plans and specifications: Yes \_\_\_ No \_\_\_

If not, explain: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

C. Procedures and/or work methods witnessed are in strict compliance with the contract specifications: Yes No \_\_\_

If not, explain: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

D. Workmanship is acceptable: Yes \_\_\_ No \_\_\_

State where improvement is needed: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

E. Workmanship is free of safety violations: Yes \_\_\_ No \_\_\_

If no, corrective action taken: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

# FORM 8-3b

## FOLLOW-UP CHECKLIST

Date:

Contractor:

Contract No:

Y=YES; N=NO; SEE REMARKS BLANK=NOT APPLICABLE	
WORK COMPLIES WITH CONTRACT AS APPROVED IN INITIAL PHASE	

IDENTIFY DEFINABLE FEATURE OF WORK, LOCATION, AND LIST PERSONNEL PRESENT

---

---

---

---

---

---

---

---

---

---

---

TESTING PERFORMED & WHO PERFORMED TEST (Include number of samples and/or tests taken)

---

---

---

---

---

---

QA Representative \_\_\_\_\_ Date \_\_\_\_\_

MEC QCS \_\_\_\_\_ Date \_\_\_\_\_



## Final Inspection Checklist (Part I)

DATE: \_\_\_\_\_

A. DEFINABLE FEATURES OF WORK: \_\_\_\_\_ Status of Inspection: \_\_\_\_\_

[illegible]

CONTRACTOR QUALITY CONTROL SYSTEMS MANAGER

B. Final Acceptance is Approved, Subject to the Correction of the Punchlist Items Below:

---



---



---



---

## Final Inspection Checklist (Part I)

DATE: \_\_\_\_\_

- ### B. Resolution of Punchlist Items:

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and extend across the width of the page. There are no margins, text, or other markings on the paper.

[illegible]

The items noted above constitute a memorandum of mutual understanding and work has been performed as planned and specified.

MEC QCS

TECHNICAL REPRESENTATIVE

## Final Inspection Checklist (Part II)

[illegible]

**FORM 8-5b**

## INSPECTION SCHEDULE AND TRACKING FORM

<b>Project:</b>	<b>Project Manager:</b>	<b>MEC QCS:</b>
-----------------	-------------------------	-----------------

[illegible]

# FORM 8-6b

## CORRECTIVE ACTION REQUEST

(1)Page 7 of 2

(2)CAR #:	(3)PRIORITY: <input type="checkbox"/> HIGH <input type="checkbox"/> NORMAL	(4)DATE PREPARED:
-----------	--	-------------------

### PART A: NOTICE OF DEFICIENCY

(5)PROJECT:		
(6)PROJECT MANAGER:	(7)MEC QCS:	
(8)WORK UNIT:	(9)WORK UNIT MANAGER:	
(10)ISSUED TO (INDIVIDUAL & ORGANIZATION):		
(11)REQUIREMENT & REFERENCE:		
(12)PROBLEM DESCRIPTION & LOCATION:		
(4)CAP REQUIRED? <input type="checkbox"/> YES <input type="checkbox"/> NO	(14)RESPONSE DUE:	
(15)ISSUED BY (PRINTED NAME & TITLE):  SIGNATURE: _____ DATE: _____		(16)MANAGEMENT CONCURRENCE:

Form 8-6B (continued)  
CORRECTIVE ACTION REQUEST

## PART B: CORRECTIVE ACTION

(17)PROPOSED CORRECTIVE ACTION/ACTION TAKEN:	
NOTE: SUPPORTING DOCUMENTATION MUST BE LISTED ON THE BACK OF THIS FORM AND ATTACHED.	
(18)PART B COMPLETED BY (NAME & TITLE):  SIGNATURE:  DATE:	(19)QC CONCURRENCE:

## PART C: CORRECTIVE ACTION VERIFICATION

(20) CAR VERIFICATION AND CLOSE-OUT: (CHECK ONLY ONE & EXPLAIN STIPULATIONS, IF ANY)

☐ APPROVED FOR CLOSURE WITHOUT STIPULATIONS

☐ APPROVED FOR CLOSURE WITH FOLLOWING STIPULATIONS

COMMENTS/STIPULATIONS:

(21) CLOSED BY (PRINTED NAME & TITLE):

SIGNATURE: \_\_\_\_\_ DATE: \_\_\_\_\_

Form 8-6B (continued)  
CORRECTIVE ACTION REQUEST

*CORRECTIVE ACTION REQUEST (CAR) INSTRUCTION SHEET*

- (1) **MEC QCS:** Verify that the total number of pages includes all attachments.
- (2) **MEC QCS:** Fill in CAR number from CAR log.
- (3) **MEC QCS:** Fill in appropriate priority category. **High** priority indicates resolution of deficiency requires expediting corrective action plan and correction of deficient conditions noted in the CAR and extraordinary resources may be required due to the deficiency's impact on continuing operations. **Normal** priority indicates that the deficiency resolution process may be accomplished without further impacting continuing operations.
- (4) **CAR Requestor:** Fill in date CAR is initiated.
- (5) **CAR Requestor:** Identify project name, number, CTO, and WAD.
- (6) **CAR Requestor:** Identify Project Manager
- (7) **CAR Requestor:** Identify CQC System Manager.
- (8) **CAR Requestor:** Identify project organization, group, or discrete work environment where deficiency was first discovered.
- (9) **CAR Requestor:** Identify line manager responsible for work unit where deficiency was discovered.
- (10) **MEC QCS:** Identify responsible manager designated to resolve deficiency (this may not be work unit manager).
- (11) **CAR Requestor:** Identify source of requirement violated in contract, work planning document, procedure, instruction, etc; use exact reference to page and, when applicable, paragraph.
- (12) **CAR Requestor:** Identify problem as it relates to requirement previously stated. Identify location of work activities impacted by deficiency.
- (4) **MEC QCS:** Identify if Corrective Action Plan (CAP) is required. CAP is typically required where one or more of the following conditions apply: CAR priority is **High**; deficiency requires a rigorous corrective action planning process to identify similar work product or activities affected by the deficiency; or deficiency requires extensive resources and planning to correct the deficiency and to prevent future recurrence.
- (14) **MEC QCS:** Identify date by which proposed corrective action is due to QC for concurrence.



Form 8-6B (continued)  
CORRECTIVE ACTION REQUEST

- (15) **MEC QCS:** Sign and date CAR and forward to responsible manager identified in (10) above.
- (16) **Responsible Manager:** Initial to acknowledge receipt of CAR.
- (17) **Responsible Manager:** Complete corrective action plan and identify date of correction. Typical corrective action response will include statement regarding how the condition occurred, what the extent of the problem is (if not readily apparent by the problem description statement in [12]), methods to be used to correct the condition, and actions to be taken to prevent the condition from recurring. If a CAP is required, refer to CAP only in this section.
- (18) **Responsible Manager:** Sign and date corrective action response.
- (19) **MEC QCS:** Initial to identify concurrence with corrective action response from responsible manager.
- (20) **MEC QCS:** Check appropriate block to identify if corrective action process is complete so that CAR may be closed. Add close-out comments relevant to block checked.
- (21) **MEC QCS:** Indicate document closeout by signing and dating.

# FORM 8-7b

## CORRECTIVE ACTION PLAN

Page 11 of 1

*Attach clarifications and additional information as needed. Identify attached material in appropriate section of this form.*

### PART A: TO BE COMPLETED BY PROJECT MANAGER OR DESIGNEE

(1)PROJECT:		
(2)PROJECT MANAGER:	(3)MEC QCS:	
(4)CAR NO(S) AND DATE(S) ISSUED:		
(5)DEFICIENCY DESCRIPTION AND LOCATION:		
(6)PLANNED ACTIONS	(7)ASSIGNED RESPONSIBILITY	(8) COMPLETION DUE DATE
(9)PROJECT MANAGER SIGNATURE:		DATE:

### PART B: TO BE COMPLETED BY MEC QCS OR DESIGNEE

(10)CAP REVIEWED BY:	DATE:
(11)REVIEWER COMMENTS:	
(12)CAP DISPOSITION: (CHECK ONLY ONE AND EXPLAIN STIPULATIONS, IF ANY) <input type="checkbox"/> APPROVED WITHOUT STIPULATIONS <input type="checkbox"/> APPROVED WITH STIPULATIONS <input type="checkbox"/> APPROVAL DELAYED, FURTHER PLANNING REQUIRED  COMMENTS:	
(4)MEC QCS SIGNATURE:	DATE:

# FORM 8-8b

## DAILY QUALITY CONTROL REPORT

Contract No.: \_\_\_\_\_

Date: \_\_\_\_\_ Task Order No.: \_\_\_\_\_ Report No: \_\_\_\_\_

LOCATION OF WORK: \_\_\_\_\_

DESCRIPTION: \_\_\_\_\_

WEATHER: (CLEAR) (FOG) (P.CLOUDY) (RAIN) (WINDY)

TEMPERATURE: MIN °F MAX °F

1. Work performed today:

\_\_\_\_\_  
\_\_\_\_\_

2. Work performed today by CH2MHILL subcontractor(s):

\_\_\_\_\_  
\_\_\_\_\_

3. Preparatory Phase Inspections performed today (include personnel present, specification section, drawings, plans, and submittals required for definable feature of work):

\_\_\_\_\_  
\_\_\_\_\_

4. Initial phase Inspections performed today (include personnel present, workmanship standard established, material certifications/test are completed, plans and drawings are reviewed):

\_\_\_\_\_  
\_\_\_\_\_

5. Follow-up Phase Inspections performed today (include locations, feature of work and level of compliance with plans and procedures):

\_\_\_\_\_  
\_\_\_\_\_

6. List tests performed, samples collected, and results received:

\_\_\_\_\_  
\_\_\_\_\_

7. Verbal instructions received (instructions given by Government representative and actions taken):

\_\_\_\_\_  
\_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

8. Non-conformances/ deficiencies reported:

---

---

---

9. Site safety monitoring activities performed today:

---

---

10. Remarks:

---

---

---

*CERTIFICATION: I certify that the above report is complete and correct and that I, or my representative, have inspected all work identified on this report performed by CH2M HILL and our subcontractor(s) and have determined to the best of my knowledge and belief that noted work activities are in compliance with the plans and specifications, except as may be noted above.*

MEC QCS (or designee) Signature: \_\_\_\_\_

# Form 8-9b

## Document Release and Review

Client:		Author:				Submittal Register Item No.:				Date:					
Document Title:								Revision:		D.O.#		WAD#			
Reviewer ( <i>print</i> )		Reviewer initial & date		Technical	Project Manager	QOC System Mgr.	Health & Safety	Editorial	Chemistry	Construction	Reviewer Comments Resolved ( <i>Signature &amp; Date</i> )				
Same as Technical Reviewer Above				X	Topic outline with objectives for each section submitted prior to Rev. A										
Program Reviewer's Acceptance for Document Submittal										Signature		Yes		No	
1) A 4025 (as applicable) prepared and submitted with document?															
2) Technical Conclusions adequately supported by text and data?															
3) Tables and Figures are in the proper format and checked and approved?															
4) The Table of Contents consistent with text information?															
5) Technical Reviewers are qualified and accepted by Technical Manager?															
6) A document Distribution List been prepared and submitted with document?															

Approval:  
 \_\_\_\_\_  
 Project Manager

Approval:  
 \_\_\_\_\_  
 MEC QCS

Recommended  
 4025 Code \_\_\_\_\_